This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

LANE MEDICAL LIBRARY STANFORD
STOR
I585 .U58 1899
Disposal of sewage and garbage in foreig
24503311154

LANE

MEDICAL LIBRARY

SEAL OF THE LELAND STANFORD JUNIOR UNIVERSITY
1885

LEVI COOPER LANE FUND

56TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 116.

SPECIAL CONSULAR REPORTS.

DISPOSAL OF SEWAGE AND GARBAGE IN FOREIGN COUNTRIES.

FOREIGN TRADE IN COAL TAR AND BY-PRODUCTS.

VOL. XVII.

REPORTS FROM CONSULS OF THE UNITED STATES IN ANSWER
TO CIRCULARS FROM THE DEPARTMENT OF STATE.

Issued from the Bureau of Foreign Commerce,
Department of State.

LANE LIBRARY

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1899.

U58
1899

CONTENTS.

Values of foreign coins and currencies 5
Foreign weights and measures 9

DISPOSAL OF SEWAGE AND GARBAGE IN FOREIGN COUNTRIES.

Europe:
  Austria-Hungary 17
  Belgium 20
  Denmark 33
  France 34
  Germany 44
  Gibraltar 75
  Italy 78
  Malta 83
  Netherlands 85
  Russia 92
  Spain 92
  Sweden and Norway 94
  Switzerland 98
  United Kingdom 107
North America:
  Dominion of Canada 171
    British Columbia 171
    Ontario 180
    New Brunswick 192
    Newfoundland 193
    Nova Scotia 194
    Quebec 195
Mexico 195
British Honduras 196
Guatemala 197
Honduras 197
Salvador 197
West Indies 198
  Cuba 198
  Dutch West Indies 199
West Indies—Continued.
  French West Indies 199
  Haiti 200
  Santo Domingo (Dominican Republic) 200
South America:
  Argentine Republic 201
  Brazil 202
  Chile 202
  Colombia 203
  Ecuador 205
  Paraguay 206
  Uruguay 206
  Venezuela 207
Africa:
  Madeira 208
  Mauritius 209
  Morocco 210
  St. Helena 210
  Zanzibar 210
Asia:
  British India 211
  China 212
  Japan 214
  Korea 216
  Persia 216
  Straits Settlements 217
  Syria 219
Australasia:
  New South Wales 220
  New Zealand 221

FOREIGN TRADE IN COAL TAR AND BY-PRODUCTS.

Europe 223
  Austria-Hungary 223
  Belgium 230
  Denmark 233
  France 234
  Great Britain 236
  Greece 236
  Italy 237
  Malta 237
  Netherlands 237
  Russia 239
  Sweden 239
  Norway 240
  Switzerland 241
  Turkey 242
America 243
  Mexico 243
  Guatemala 243
  Salvador 244
  West Indies 244
  Argentine Republic 246
  Ecuador 247
  Paraguay 247
  Uruguay 248
Asia 249
  British India 249
  Dutch India 250
  Japan 251
  Persia 252
  Straits Settlements 253
  Syria 253
Australasia 254
  New South Wales 254
  New Zealand 255
  Queensland 255
  Victoria 256
  Tasmania 257
Africa 258
  British South Africa 258
  Lourenço Marquez 258
  Morocco 258
  Zanzibar 259

9226

VALUES OF FOREIGN COINS AND CURRENCIES.

The following statements show the valuation of foreign coins, as given by the Director of the United States Mint and published by the Secretary of the Treasury, in compliance with the first section of the act of March 3, 1873, viz: "That the value of foreign coins, as expressed in the money of account of the United States, shall be that of the pure metal of such coin of standard value," and that "the value of the standard coins in circulation of the various nations of the world shall be estimated annually by the Director of the Mint, and be proclaimed on the 1st day of January by the Secretary of the Treasury."

In compliance with the foregoing provisions of law, annual statements were issued by the Treasury Department, beginning with that issued on January 1, 1874, and ending with that issued on January 1, 1890. Since that date, in compliance with the act of October 1, 1890, these valuation statements have been issued quarterly, beginning with the statement issued on January 1, 1891.

The fact that the market exchange value of foreign coins differs in many instances from that given by the United States Treasury has been repeatedly called to the attention of the Bureau of Foreign Commerce. An explanation of the basis of the quarterly valuations was asked from the United States Director of the Mint, and under date of February 7, 1898, Mr. R. E. Preston makes the following statement:

"When a country has the single gold standard, the value of its standard coins is estimated to be that of the number of grains fine of gold in them, 480 grains being reckoned equivalent to $20.67 in United States gold, and a smaller number of grains in proportion. When a country has the double standard, but keeps its full legal-tender silver coins at par with gold, the coins of both gold and silver are calculated on the basis of the gold value.

"The value of the standard coins of countries with the single silver standard is calculated to be that of the average market value of the pure metal they contained during the three months preceding the date of the proclamation of their value in United States gold by the Secretary of the Treasury. The value of the gold coins of silver-standard countries is calculated at that of the pure gold they contain, just as if they had the single gold standard.

"These valuations are used in estimating the values of all foreign merchandise exported to the United States. The value of the Indian rupee, although calculated according to law at the value of the pure metal contained therein, has a commercial value above the value of the silver bullion; consequently the value for customs purposes is determined in each case by the consular certificates attached to the invoice of exports from that country to the United States."

The following statements, running from January 1, 1874, to April 1, 1899, have been prepared to assist in computing the values in American money of the trade, prices, values, wages, etc., of and in foreign countries, as given in consular and other reports. The series of years are given, so that computations may be made for each year in the proper money values of such year. In hurried computations, the reductions of foreign currencies into American currency, no matter for how many years, are too often made on the bases of latest valuations. When it is taken into account that the ruble of Russia, for instance, fluctuated from 77.17 cents in 1874 to 37.4 cents in April, 1897, such computations are wholly misleading. All computations of values, trade, wages, prices, etc., of and in the "fluctuating-currency countries" should be made in the values of their currencies in each year up to and including 1890, and in the quarterly valuations thereafter.

To meet typographical requirements, the quotations for the years 1876, 1877, 1879, 1881, 1882, and 1891-95 are omitted, these years being selected as showing the least fluctuations when compared with years immediately preceding and following.

To save unnecessary repetition, the estimates of valuations are divided into three classes, viz: (A) Countries with fixed currencies; (B) countries with fluctuating currencies, and (C) quarterly valuations of fluctuating currencies.

A.—*Countries with fixed currencies.*

The following official (United States Treasury) valuations of foreign coins do not include "rates of exchange."

Countries.	Standard.	Monetary unit.	Value in United States gold.	Coins.
Argentine Republic[1]	Gold and silver	Peso	$0.96,5	Gold—Argentine ($4.82,4) and ½ Argentine; silver—peso and divisions.
Austria-Hungary[2]	Gold	Crown	.20,3	Gold—20 crowns ($4.05.2) and 10 crowns.
Belgium	Gold and silver	Franc	.19,3	Gold—10 and 20 franc pieces; silver—5 francs
Brazil	Gold	Milreis	.54,6	Gold—5, 10, and 20 milreis; silver—½, 1, and 2 milreis.
British North America (except Newfoundland).	do	Dollar	1.00	
British Honduras	do	do	1.00	
Chile	do	Peso	.36,5	Gold—escudo ($1.25), doubloon ($3.65), and condor ($7.30); silver—peso and divisions
Costa Rica	do	Colon	.46,5	Gold—2, 5, 10, and 20 colons; silver—5, 10, 25, and 50 centisimos.
Cuba	Gold and silver	Peso	.92,6	Gold—doubloon ($5.01,7); silver—peso (60 cents).
Denmark	Gold	Crown	.26,8	Gold—10 and 20 crowns.
Egypt	do	Pound (100 piasters).	4.94,3	Gold—10, 20, 50, and 100 piasters; silver—1, 2, 10, and 20 piasters.
Finland	do	Mark	.19,3	Gold—10 and 20 marks ($1.93 and $3.85,9).
France	Gold and silver	Franc	.19,3	Gold—5, 10, 20, 50, and 100 francs; silver—5 francs.
Germany	Gold	Mark	.23,8	Gold—5, 10, and 20 marks.
Great Britain	do	Pound sterling	4.86,6½	Gold—sovereign (pound sterling) and half sovereign.
Greece	Gold and silver	Drachma	.19,3	Gold—5, 10, 20, 50, and 100 drachmas; silver—5 drachmas.
Haiti	do	Gourde	.96,5	Silver—gourde.
Italy	do	Lira	.19,3	Gold—5, 10, 20, 50, and 100 lire; silver—5 lire.
Japan[3]	Gold	Yen	.49,8	Gold—1, 2, 5, 10, and 20 yen.
Liberia	do	Dollar	1.00	
Netherlands[4]	Gold and silver	Florin	.40,2	Gold—10 florins; silver—½, 1, and 2½ florins.
Newfoundland	Gold	Dollar	1.01,4	Gold—$2 ($2.02,7).
Portugal	do	Milreis	1.08	Gold—1, 2, 5, and 10 milreis.
Russia[5]	do	Ruble	.51,5	Gold—imperial ($7.71,8) and ½ imperial ($3.80); silver—¼, ½, and 1 ruble.
Spain	Gold and silver	Peseta	.19,3	Gold—25 pesetas; silver—5 pesetas.
Sweden and Norway	Gold	Crown	.26,8	Gold—10 and 20 crowns.
Switzerland	Gold and silver	Franc	.19,3	Gold—5, 10, 20, 50, and 100 francs; silver—5 francs.
Turkey	Gold	Piaster	.04,4	Gold—25, 50, 100, 200, and 500 piasters.
Uruguay	do	Peso	1.03,4	Gold—peso; silver—peso and divisions.
Venezuela	Gold and silver	Bolivar	.19,3	Gold—5, 10, 20, 50, and 100 bolivars; silver—5 bolivars.

---

[1] In 1874 and 1875 the gold standard prevailed.

[2] The gold standard was adopted October 1, 1892. (See Consular Reports, No. 147, p. 623.) Values are still, however, frequently expressed in the florin or gulden, which is worth 2 crowns, or 40.6 cents.

[3] Gold standard adopted October 1, 1897. (See Consular Reports, No. 201, p. 259.)

[4] See note to table of fluctuating currencies.

[5] For an account of the adoption of the gold standard, see Review of the World's Commerce, 1896–97, p. 254.

B.—*Countries with fluctuating currencies, 1874-1890.*

Countries.	Standard.	Monetary unit.	Value in terms of the United States gold dollar on January 1—					
			1874.	1875.	1878.	1880.	1883.	1884.
Austria-Hungary[1]	Silver	Florin	$0.47, 6	$0.45, 3	$0.45, 3	$0.41, 3	$0.40, 1	$0.39, 8
Bolivia	do	Dollar until 1890: boliviano thereafter.	.96, 5	.96, 5	.96, 5	.83, 6	.81, 2	.80, 6
Central America	do	Peso	.96, 5	.91, 8	.91, 8	.83, 6	....	....
China	do	Haikwan tael.	1.61	1.61	....	....	....	....
Colombia	do	Peso	.96, 5	.96, 5	.96, 5	.83, 6	.81, 2	.80, 6
Ecuador	do	do	.96, 5	.91, 8	.91, 8	.83, 6	.81, 2	.80, 6
Egypt[2]	Gold	Pound (100 piasters).	....	....	4.97, 4	4.97, 4	4.90	4.90
India	Silver	Rupee	.45, 8	.43, 6	.43, 6	.39, 7	.38, 6	.38, 8
Japan	Gold	Yen	.99, 7	.99, 7	.99, 7	.99, 7	....	....
	Silver		....	....	....	....	.87, 6	.86, 9
Mexico	do	Dollar	1.04, 7½	.99, 8	.99, 8	.90. 9	.88, 2	.87, 5
Netherlands[3]	Gold and silver.	Florin	.40, 5	.38, 5	.38, 5	.40, 2	....	....
Peru	Silver	Sol	.92, 5	.91, 8	.91, 8	.83, 6	.81, 2	.80, 6
Russia	do	Ruble	.77, 17	.73, 4	.73, 4	.66, 9	.65	.64, 5
Tripoli	do	Mahbub of 20 piasters.	.87, 09	.82, 9	.82, 9	.74, 8	.73, 3	.72, 7

Countries.	Standard.	Monetary unit.	Value in terms of the United States gold dollar on January 1—					
			1885.	1886.	1887.	1888.	1889.	1890.
Austria-Hungary[1]	Silver	Florin	$0.39, 3	$0.37, 1	$0.35, 9	$0.34, 5	$0.33, 6	$0.42
Bolivia	do	Dollar until 1890; boliviano thereafter.	.79. 5	.75, 1	.72, 7	.69, 9	.68	.85
Central America	do	Peso	....	....	....	.69, 9	.68	.85
Colombia	do	do	.79, 5	.75, 1	.72, 7	.69, 9	.68	.85
Ecuador	do	do	.79, 5	.75, 1	.72, 7	.69, 9	.68	.85
Egypt[2]	Gold	Pound (100 piasters).	4.90	4.90	4.94, 3	4.94, 3	4.94, 3	4.94, 3
India	Silver	Rupee	.37, 8	.35, 7	.34, 6	.32, 2	.32, 3	.40, 4
Japan	Gold	Yen	....	....	.99, 7	.99, 7	.99, 7	.99, 7
	Silver		.85, 8	.81	.78, 4	.75, 3	.73, 4	.91, 7
Mexico	do	Dollar	.86, 4	.81, 6	.79	.75, 9	.73, 9	.92, 3
Peru	do	Sol	.79, 5	.75, 1	.72, 7	.69, 9	.68	.85
Russia	do	Ruble	.63, 6	.60, 1	.58, 2	.55, 9	.54, 4	.68
Tripoli	do	Mahbub of 20 piasters.	.71, 7	.67, 7	.65, 6	.63	.61, 4	.76, 7

---

[1] The silver standard prevailed in Austria-Hungary up to 1892. The law of August 2 of that year (see Consular Reports, No. 147, p. 623) established the gold standard.

[2] The Egyptian pound became fixed in value at $4.94,3 in 1887.

[3] The Netherlands florin fluctuated up to the year 1880, when it became fixed at 40.2 cents.

C.—*Quarterly valuations of fluctuating currencies.*

Countries.	Monetary unit.	1896.				1897.			
		Jan. 1.	Apr. 1.	July 1.	Oct. 1.	Jan. 1.	Apr. 1.	July 1.	Oct. 1.
Bolivia	Silver boliviano	$0.49,1	$0.49,3	$0.49,7	$0.49	$0.47,4	$0.46,8	$0.44,3	$0.41,2
Central America.	Silver peso	.49,1	.49,3	.49,7	.49	.47,4	.46,5	.44,3	.41,2
China	Amoy tael	....	....	....	.79,3	.76,7	.75,7	.71,7	.66,4
	Canton tael	....	....	....	.79	.76,5	.75,5	.71,5	.66,4
	Chefoo tael	.75,9	.76,3	.76,9	.75,8	.73,3	.72,4	.68,6	.63,7
	Chinkiang tael	....	....	....	.77,4	.74,9	.73,9	.70	.65,1
	Fuchau tael	....	....	....	.73,3	.70,9	.70	.66,3	.61,6
	Haikwan tael	.80,8	.81,2	.81,9	.80,6	.78	.77	.73,1	.67,8
	Hankau tael	....	....	....	.74,2	.71,7	.70,8	.67,1	.62,3
	Ningpo tael	....	....	....	.76,2	.73,7	.72,8	.68,9	.64
	Niuchwang tael	....	....	....	.74,3	.71,9	.71	.67,2	.62,5
	Shanghai tael	.72,5	.72,9	.73,5	.72,4	.70	.69,1	.65,5	.60,8
	Swatow tael	....	....	....	.73,2	.70,8	.69,9	.66,2	.61,5
	Takao tael	....	....	....	.79,8	.77,2	.76,2	.72,2	.67
	Tientsin tael	.76,9	.77,3	.78	.76,8	.74,3	.73,4	.69,5	.64,6
Colombia	Silver peso	.49,1	.49,3	.49,7	.49	.47,4	.46,8	.44,3	.41,2
Ecuador	do	.49,1	.49,3	.49,7	.49	.47,4	.46,8	.44,3	.41,2
India	Silver rupee	.23,3	.23,4	.23,6	.23,3	.22,5	.22,2	.21,1	.19,6
Japan	Silver yen	.52,9	.53,2	.53,2	.52,8	.51,1	.50,5	....	....
Mexico	Silver dollar	.53,3	.53,6	.54	.53,2	.51,5	.50,8	.48,2	.44,6
Persia	Silver kran	.09	.09,1	.09,2	.09	.08,7	.08,6	.08,2	.07,6
Peru	Silver sol	.49,1	.49,3	.49,7	.49	.47,4	.46,8	.44,3	.41,2
Russia	Silver ruble	.39,3	.39,5	.39,8	.39,2	.37,9	.37,4	....	....
Tripoli	Silver mahbub	.44,3	.44,5	.44,9	.44,2	....	....	....	....

Countries.	Monetary unit.	1898.				1899.		
		Jan. 1.	Apr. 1.	July 1.	Oct. 1.	Jan. 1.	Apr. 1.	July 1.
Bolivia	Silver boliviano	$0.42,4	$0.40,9	$0.41,8	$0.43,6	$0.43,9	$0.43,4	$0.44,3
Central America	Silver peso	.41,4	.40,9	.41,8	.43,6	.43,9	.43,4	.44,3
China	Amoy tael	.68,5	.66,2	.67,6	.70,6	.71	.70,2	.71,6
	Canton tael	.68,3	.66	.67,4	.70,4	.70,8	.70	.71,4
	Chefoo tael	.65,5	.63,3	.64,6	.67,5	.67,9	.67,2	.68,4
	Chinkiang tael	.66,9	.64,6	.66	.69	.69,3	.68,6	.69,9
	Fuchau tael	.63,4	.61,2	.62,5	.65,3	.65,6	.65	.66,2
	Haikwan tael	.69,7	.67,3	.68,8	.71,8	.72,2	.71,4	.72,8
	Hankau tael	.64,1	.61,9	.63,2	.66	.66,4	.65,7	.67
	Ningpo tael	.64,3	.63	.65	.67,9	.68,2	.67,5	.68,8
	Niuchwang tael	.65,9	.62	.63,4	.66,2	.66,5	.65,9	.67,1
	Shanghai tael	.62,6	.60,4	.61,7	.64,5	.64,8	.64,1	.65,4
	Swatow tael	.63,3	.61,1	.62,4	.65,2	.65,5	.64,9	.66,1
	Takao tael	.66	.66,6	.68	.71	.71,4	.70,7	.72
	Tientsin tael	.66,4	.64,1	.65,5	.68,4	.68,8	.68	.69,4
Colombia	Silver peso	.42,4	.40,9	.41,8	.43,6	.43,9	.43,4	.44,3
Ecuador	do	.42,4	.40,9	.41,8	.43,6	.43,9	.43,4	.44,3
India[1]	Silver rupee	.20,1	.19,1	.19,9	.20,7	.20,8	.20,6	.21
Mexico	Silver dollar	.46	.44,4	.45,4	.47,4	.47,7	.47,2	.48,1
Persia	Silver kran	.07,8	.07,5	.07,7	.08	.08,1	.08	.08,2
Peru	Silver sol	.42,4	.40,9	.41,8	.43,6	.43,9	.43,4	.44,3

---

[1] The commercial value of the rupee to be determined by consular certificate.

FOREIGN WEIGHTS AND MEASURES.

The following table embraces only such weights and measures as are given from time to time in Consular Reports and in Commercial Relations:

Foreign weights and measures, with American equivalents.

Denominations.	Where used.	American equivalents.
Almude	Portugal	4.422 gallons.
Ardeb	Egypt	7.6907 bushels.
Are	Metric	0.02471 acre.
Arobe	Paraguay	25 pounds.
Arratel or libra	Portugal	1.011 pounds.
Arroba (dry)	Argentine Republic	25.3175 pounds.
Do	Brazil	32.38 pounds.
Do	Cuba	25.3664 pounds.
Do	Portugal	32.38 pounds.
Do	Spain	25.36 pounds.
Do	Venezuela	25.4024 pounds.
Arroba (liquid)	Cuba, Spain, and Venezuela	4.263 gallons.
Arshine	Russia	28 inches.
Arshine (square)	do	5.44 square feet.
Artel	Morocco	1.12 pounds.
Baril	Argentine Republic and Mexico	20.0787 gallons.
Barrel	Malta (customs)	11.4 gallons.
Do	Spain (raisins)	100 pounds.
Berkovets	Russia	361.12 pounds.
Bongkal	India	832 grains.
Bouw	Sumatra	7,096.5 square meters.
Bu	Japan	0.1 inch.
Butt (wine)	Spain	140 gallons.
Caffiso	Malta	5.4 gallons.
Candy	India (Bombay)	529 pounds.
Do	India (Madras)	500 pounds.
Cantar	Morocco	113 pounds.
Do	Syria (Damascus)	575 pounds.
Do	Turkey	124.7036 pounds.
Cantaro (cantar)	Malta	175 pounds.
Carga	Mexico and Salvador	300 pounds.
Catty	China	1.333⅓ (1⅓) pounds.
Do[1]	Japan	1.31 pounds.
Do	Java, Siam, and Malacca	1.35 pounds
Do	Sumatra	2.12 pounds.
Centaro	Central America	4.2631 gallons.
Centner	Bremen and Brunswick	117.5 pounds.
Do	Darmstadt	110.24 pounds.
Do	Denmark and Norway	110.11 pounds.
Do	Nuremberg	112.43 pounds.
Do	Prussia	113.44 pounds.
Do	Sweden	93.7 pounds.
Do	Vienna	123.5 pounds.
Do	Zollverein	110.24 pounds.
Do	Double or metric	220.46 pounds.
Chih	China	14 inches.
Coyan	Sarawak	3,098 pounds.
Do	Siam (Koyan)	2,667 pounds.
Cuadra	Argentine Republic	4.2 acres.
Do	Paraguay	78.9 yards.
Do	Paraguay (square)	8.077 square feet.
Do	Uruguay	Nearly 2 acres.
Cubic meter	Metric	35.3 cubic feet.
Cwt. (hundredweight)	British	112 pounds.
Dessiatine	Russia	2 6997 acres.
Do	Spain	1.599 bushels.
Drachme	Greece	Half ounce.
Egyptian weights and measures	(See Consular Reports, No. 144.)	

[1] More frequently called "kin." Among merchants in the treaty ports it equals 1.33⅓ pounds avoirdupois.

Foreign weights and measures, with American equivalents—Continued.

Denominations.	Where used.	American equivalents.
Fanega (dry)	Central America	1.5745 bushels.
Do	Chile	2.575 bushels.
Do	Cuba	1.599 bushels.
Do	Mexico	1.54728 bushels.
Do	Morocco	Strike fanega, 70 lbs.; full fanega, 118 lbs.
Do	Uruguay (double)	7.776 bushels.
Do	Uruguay (single)	3.888 bushels.
Do	Venezuela	1.599 bushels.
Fanega (liquid)	Spain	16 gallons.
Feddan	Egypt	1.03 acres.
Frail (raisins)	Spain	50 pounds.
Frasco	Argentine Republic	2.5096 quarts.
Do	Mexico	2.5 quarts.
Fuder	Luxemburg	264.17 gallons.
Garnice	Russian Poland	0.88 gallon.
Gram	Metric	15.432 grains.
Hectare	do	2.471 acres.
Hectoliter:		
Dry	do	2.838 bushels.
Liquid	do	26.417 gallons.
Joch	Austria-Hungary	1.422 acres.
Ken	Japan	6 feet.
Kilogram (kilo)	Metric	2.2046 pounds.
Kilometer	do	0.621376 mile.
Klafter	Russia	216 cubic feet.
Koku	Japan	4.9629 bushels.
Korree	Russia	3.5 bushels.
Last	Belgium and Holland	85.134 bushels.
Do	England (dry malt)	82.52 bushels.
Do	Germany	2 metric tons (4,480 lbs.).
Do	Prussia	112.29 bushels.
Do	Russian Poland	11⅓ bushels.
Do	Spain (salt)	4,760 pounds.
League (land)	Paraguay	4,633 acres.
Li	China	2,115 feet.
Libra (pound)	Castilian	7,100 grains (troy).
Do	Argentine Republic	1.0127 pounds.
Do	Central America	1.043 pounds.
Do	Chile	1.014 pounds.
Do	Cuba	1.0161 pounds.
Do	Mexico	1.01465 pounds.
Do	Peru	1.0143 pounds.
Do	Portugal	1.011 pounds.
Do	Uruguay	1.0143 pounds.
Do	Venezuela	1.0161 pounds.
Liter	Metric	1.0567 quarts.
Livre (pound)	Greece	1.1 pounds.
Do	Guiana	1.0791 pounds.
Load	England (timber)	Square, 50 cubic feet; unhewn, 40 cubic feet; inch planks, 600 superficial feet.
Manzana	Costa Rica	1½ acres.
Do	Nicaragua and Salvador	1.727 acres.
Marc	Bolivia	0.507 pound.
Maund	India	82²⁄₇ pounds.
Meter	Metric	39.37 inches.
Mil	Denmark	4.68 miles.
Do	Denmark (geographical)	4.61 miles.
Milla	Nicaragua and Honduras	1.1493 miles.
Morgen	Prussia	0.63 acre.
Oke	Egypt	2.7225 pounds.
Do	Greece	2.84 pounds.
Do	Hungary	3.0817 pounds.
Do	Turkey	2.85418 pounds.
Do	Hungary and Wallachia	2.5 pints.
Pic	Egypt	21¼ inches.
Picul	Borneo and Celebes	135.64 pounds.
Do	China, Japan, and Sumatra	133⅓ pounds.
Do	Java	135.1 pounds.
Do	Philippine Islands (hemp)	139.45 pounds.
Do	Philippine Islands (sugar)	140 pounds.
Pie	Argentine Republic	0.9478 foot.
Do	Castile	0.91407 foot.
Pik	Turkey	27.9 inches.
Pood	Russia	36.112 pounds.
Pund (pound)	Denmark and Sweden	1.102 pounds.
Quarter	Great Britain	8.252 bushels.
Do	London (coal)	36 bushels.
Quintal	Argentine Republic	101.42 pounds.
Do	Brazil	130.06 pounds.

Foreign weights and measures, with American equivalents—Continued.

Denominations.	Where used.	American equivalents.
Quintal	Castile, Chile, Mexico, and Peru	101.61 pounds.
Do	Greece	123.2 pounds.
Do	Newfoundland (fish)	112 pounds.
Do	Paraguay	100 pounds.
Do	Syria	125 pounds.
Do	Metric	220.46 pounds.
Rottle	Palestine	6 pounds.
Do	Syria	5¾ pounds.
Sagen	Russia	7 feet.
Salm	Malta	490 pounds.
Se	Japan	0.02451 acre.
Seer	India	1 pound 13 ounces.
Shaku	Japan	11.9305 inches.
Sho	do	1.6 quarts.
Standard (St. Petersburg)	Lumber measure	165 cubic feet.
Stone	British	14 pounds.
Suerte	Uruguay	2,700 cuadras (see Cuadra).
Sun	Japan	1.193 inches.
Tael	Cochin China	590.75 grains (troy).
Tan	Japan	0.25 acre.
To	do	2 pecks.
Ton	Space measure	40 cubic feet.
Tonde (cereals)	Denmark	3.94783 bushels.
Tondeland	do	1.36 acres.
Tsubo	Japan	6 feet square.
Tsun	China	1.41 inches.
Tunna	Sweden	4.5 bushels.
Tunnland	do	1.22 acres.
Vara	Argentine Republic	34.1208 inches.
Do	Castile	0.914117 yard.
Do	Central America	32.87 inches.
Do	Chile and Peru	33.367 inches.
Do	Cuba	33.384 inches.
Do	Curaçao	33.375 inches.
Do	Mexico	33 inches.
Do	Paraguay	34 inches.
Do	Venezuela	33.384 inches.
Vedro	Russia	2.707 gallons.
Vergees	Isle of Jersey	71.1 square rods.
Verst	Russia	0.663 mile.
Vlocka	Russian Poland	41.98 acres.

METRIC WEIGHTS AND MEASURES.

Metric weights:
- Milligram ($\frac{1}{1000}$ gram) equals 0.0154 grain.
- Centigram ($\frac{1}{100}$ gram) equals 0.1543 grain.
- Decigram ($\frac{1}{10}$ gram) equals 1.5432 grains.
- Gram equals 15.432 grains.
- Decagram (10 grams) equals 0.3527 ounce.
- Hectogram (100 grams) equals 3.5274 ounces.
- Kilogram (1,000 grams) equals 2.2046 pounds.
- Myriagram (10,000 grams) equals 22.046 pounds.
- Quintal (100,000 grams) equals 220.46 pounds.
- Millier or tonnea—ton (1,000,000 grams) equals 2,204.6 pounds.

Metric dry measures:
- Milliliter ($\frac{1}{1000}$ liter) equals 0.061 cubic inch.
- Centiliter ($\frac{1}{100}$ liter) equals 0.6102 cubic inch.
- Deciliter ($\frac{1}{10}$ liter) equals 6.1022 cubic inches.
- Liter equals 0.908 quart.
- Decaliter (10 liters) equals 9.08 quarts.
- Hectoliter (100 liters) equals 2.838 bushels.
- Kiloliter (1,000 liters) equals 1.308 cubic yards.

Metric liquid measures:
- Milliliter ($\frac{1}{1000}$ liter) equals 0.0388 fluid ounce.
- Centiliter ($\frac{1}{100}$ liter) equals 0.338 fluid ounce.
- Deciliter ($\frac{1}{10}$ liter) equals 0.845 gill.
- Liter equals 1.0567 quarts.
- Decaliter (10 liters) equals 2.6418 gallons.
- Hectoliter (100 liters) equals 26.417 gallons.
- Kiloliter (1,000 liters) equals 264.18 gallons.

- Metric measures of length:
  - Millimeter ($\frac{1}{1000}$ meter) equals 0.0394 inch.
  - Centimeter ($\frac{1}{100}$ meter) equals 0.3937 inch.
  - Decimeter ($\frac{1}{10}$ meter) equals 3.937 inches.
  - Meter equals 39.37 inches.
  - Decameter (10 meters) equals 393.7 inches.
  - Hectometer (100 meters) equals 328 feet 1 inch.
  - Kilometer (1,000 meters) equals 0.62137 mile (3,280 feet 10 inches).
  - Myriameter (10,000 meters) equals 6.2137 miles.
- Metric surface measures:
  - Centare (1 square meter) equals 1,550 square inches.
  - Are (100 square meters) equals 119.6 square yards.
  - Hectare (10,000 square meters) equals 2.471 acres.

DISPOSAL OF SEWAGE AND GARBAGE IN FOREIGN COUNTRIES.

DEPARTMENT CIRCULAR.

DEPARTMENT OF STATE,
Washington, January 20, 1898.

To the consular officers of the United States.

GENTLEMEN: The Department of Agriculture desires to obtain accurate information in regard to the disposal of garbage, sewage, etc., in foreign cities, and for this purpose has prepared a statement giving in detail the scope of the investigation which it has requested this Department to make through the cooperation of consular officers.

I inclose a copy of this statement for your information and guidance, and will be pleased to have you make the desired investigation in the manner suggested therein and prepare and forward a report upon the subject to this Department at your earliest convenience, if the matter is one treated by modern scientific methods in your district or would be of special interest for other reasons.

Respectfully, yours,

THOS. W. CRIDLER,
Third Assistant Secretary.

UNITED STATES DEPARTMENT OF AGRICULTURE,
DIVISION OF CHEMISTRY,
Washington, D. C., December 1, 1897.

DIRECTIONS FOR SECURING INFORMATION IN REGARD TO THE DISPOSAL OF GARBAGE, SEWAGE, ETC., IN FOREIGN CITIES.

The United States Department of Agriculture has entered upon the study of modern methods for the disposal of city wastes with the view of extending their use for fertilization in all cases where this can be economically done without violating the laws of good sanitation. In order that we may do this to the best advantage, we must have at hand the results of experiments that have been made in this line abroad, and therefore we invite your assistance in obtaining information in regard to the methods in use for the disposal of the wastes of the cities and towns in your consular district.

In studying this subject, the agricultural utilization of these materials may be considered from three standpoints:

First. In the case of some materials, under certain conditions their fertilizing value may be so great that their use in agriculture will yield a distinct profit to farmers and to urban communities.

Second. The fertilizing value of the materials may be sufficient to partly pay the cost of a given method of disposal.

Third. A scheme of utilization may be developed in which materials having industrial or fuel value can be turned to account in the preparation for market of materials having fertilizing value.

It is only when considered from this latter point of view that the agronomist can be interested in many of the materials concerning which we are asking for information.

Information is desired in regard to methods for the collection, removal, and final disposal of the following waste materials: Garbage, the waste of animal and vegetable foods of all kinds; tin cans, bottles, broken glass and crockery, ashes, sawdust, floor sweepings, grass and weeds; paper and coarse rubbish, including boxes, old shoes, leather and rubber scraps, fragments of carpets, worn-out household articles and cooking utensils of metal or other materials, etc.; household waste waters from the kitchen, laundry, and chambers; water-carried sewage; excrementitious matter not water-carried; street sweepings; factory wastes, solid and liquid; market and abattoir refuse; dead animals, including horses, cattle, sheep, swine, dogs cats, etc.

It is often the case, in this country at least, that the latest and most sanitary methods for the disposal of wastes are first adopted in comparatively small cities.

You will, undoubtedly, find that two or more of the classes of materials enumerated are collected and disposed of together, and will have to be treated collectively in your report. In all cases state definitely what materials and what proportion thereof go to make up each waste product of which you describe the method of disposal. For example, when speaking of garbage, state clearly whether tin cans, ashes, etc., are included therein.

Your work will in the majority of cases be greatly facilitated, and perhaps completed, by obtaining and forwarding to us copies of official reports upon these subjects by the boards of health, etc., of the cities in your consular districts. In addition to publications of this nature, copies of or references to any articles in periodical literature or in books will be of great value to us. When improvements have been made subsequent to the publication of reports, as complete data as may be obtainable in regard to their cost, length of time in use, apparent value, etc., should be furnished.

Send copies of official regulations governing the collection, removal, and disposal of these materials, if obtainable.

Whenever printed reports are not available, please obtain information in regard to the different classes of materials as follows:

GARBAGE.

Name of the city and its population.

What does the material contain as collected in addition to the waste of animal and vegetable foods?

What is the amount of material collected, and what is the system of collection employed? What is the cost for the collection and removal of the material from the city? Is this work done by the city government or by contract?

What is the cost and manner of final disposal of the material? Describe the method of final disposal, and state how long it has been in use and what methods have been previously tried and abandoned.

In case the material is cremated or is treated for the manufacture of grease or fertilizer, state whether the plant is owned and operated by the city or by a contractor, the commercial value of the products, their chemical composition, etc.

TIN CANS, BOTTLES, BROKEN GLASS AND CROCKERY, ASHES, SAWDUST, FLOOR SWEEPINGS, GREASE, PAPER, AND OTHER COARSE RUBBISH.

Furnish us descriptions and data in regard to the cost or profit, length of time in use, etc., of any systematic methods that are in use for the collection and utilization of any of these materials in the cities of your consular district.

The importance of these materials has been very clearly demonstrated at the plant for the sorting and disposal of paper and refuse recently installed by the city of New York.

HOUSEHOLD WASTE WATERS FROM THE KITCHEN, LAUNDRY, AND CHAMBERS.

What disposition is made of these liquids in the absence of house connections with the public sewer systems? What proportion of the houses in each city is provided with sewer connections for this purpose?

EXCREMENTITOUS MATTER NOT WATER-CARRIED.

In case of each of the cities for which you furnish information, in what proportion of the habitations is the water system in use for the removal of these materials? In the absence thereof, what system of collection and disposal is in use?

WATER-CARRIED SEWAGE.

What system is in use in the various cities of your consular district for the final disposal of water-carried sewage?

Is the combined or separate sewer system in use?

Whenever pumps are used for delivering the sewage at the place of disposal, state the cost of installing and operating the pumping plant, the volume of liquid pumped, the population of the city, etc.

In cases where the sewage is used for the irrigation of cultivated land, describe the system employed and state the length of time that it has been in use, the cost of its installation and maintenance, kind of crops grown, income from sale of crops, etc. Does the sewage farm belong to the city? If not, what is the financial arrangement between the city and the owner of the farm?

Does the sewage receive any treatment before its arrival on the fields? If so, describe the process and state the cost.

Is the land underdrained?

What is the relation between the population of each city and the area of the filter beds?

Do any of the cities or towns in your consular district collect the sewage and treat it with chemicals for the precipitation of suspended and dissolved matter? If so, describe the process used and state the cost of installing and maintaining the plant, kind, cost, and amount of chemicals used, etc.

What is the population of the city, and what is the volume of the sewage treated?

What is the amount and chemical composition of the precipitated matters obtained, and what is done with them?

In case the sludge is sold for the fertilization of land, what is the price received for it, and what proportion of the total sludge is thus sold?

STREET SWEEPINGS.

What methods are in use for the collection, removal, and disposal of street sweepings? Are these operations performed by the city government or by contract? Give the cost for collection, cost for removal, and cost for final disposal for each city.

What is the population of each city for which you report statistics?

Since the agricultural value of sweepings varies with the nature of the pavements and the manner of collecting, the kind of pavements and the manner of collection should be mentioned in each case.

FACTORY WASTES, SOLID AND LIQUID.

Are there any manufacturing establishments in your consular district furnishing waste products of agricultural or sanitary interest? If so, describe these products and state the methods used for their disposal. What are the official regulations governing the wastes of factories?

MARKET AND ABATTOIR REFUSE.

What methods of disposal are employed for these materials?

DEAD ANIMALS.

What methods are in use for their disposal? What is the cost or profit to the municipality for their collection, removal, and disposal?

Describe any methods in use for the industrial or agricultural utilization of the carcasses of dead animals.

EUROPE.

AUSTRIA-HUNGARY.

REICHENBERG.

The population within the corporate limits of Reichenberg numbers 34,000, but immediately adjacent to and dependent upon the city, and separated from it by invisible boundaries, is a population at least as great as that named.

Most of the collected garbage consists of ashes; then come kitchen stuffs, sweepings, broken glass and crockery, and refuse paper. These various elements are placed in receptacles by the house owners and are removed privately or by the public wagons provided for that purpose by the city. Eight hundred house owners in this city use these public garbage wagons, but their employment is not compulsory. The cost of removal to the city is 4,000 florins ($1,624) a year, of which sum 2,400 florins ($974) are recovered from the house owners who use the public wagons, by means of a tax levied upon them. Much of the garbage is used in repairing roads, sand being put over it when dumped on roads or low places. The collected manure is sold to persons who use it to fertilize fields. The revenue to the city therefrom is about 80 florins ($32.48) a year. None of this garbage is used for manufacturing or for any other purposes than those stated above.

The public sewers of Reichenberg carry away the household waste water and other liquids from all but the few buildings not connected with the system. The latter must be provided with waterproof pits, from which the liquids are from time to time removed.

Excrementitious matter is not carried through the sewers, the water supply not being sufficient. Dwelling and business premises are provided with water-tight sink holes, which are specially prescribed and carefully inspected by the local authorities. These depositories are emptied into iron reservoirs constructed for the purpose. The pneumatic process and a large hose are used to convey the contents of the depository to the iron reservoir. These excrements are taken directly to farms in the neighborhood, where, without treatment of any sort, they are used as fertilizing material. This pneumatic removal costs the city 10,000 florins ($4,060) a year, and every day four to six teams are employed in the work.

The streets of Reichenberg are swept with coarse brooms by men employed by the city. The sweepings are formed into small heaps by the roadside, removed by a contractor, and finally disposed of to farmers for agricultural purposes. The cost of this entire operation amounts to

17,000 florins ($6,902) annually. The streets of Reichenberg are all paved with granite blocks.

No manufacturing establishments here furnish waste products of agricultural or sanitary interest. The waste products of factories which would defile the water of the streams, or conflict with the sanitary regulations, must be purified by chemical process and made innoxious. No regulations govern this matter in detail, each case being decided separately by the local sanitary authorities.

Market refuse is removed in the same manner as street sweepings.

Dead animals and the refuse from abattoirs are collected by an official appointed for that purpose, and by him buried in a designated place. The city pays him 200 florins ($81.20) a year, and receives no profit from this source. I can learn of no methods employed in this district for the industrial or agricultural utilization of the carcasses of dead animals.

FRANK W. MAHIN, *Consul.*

REICHENBERG, AUSTRIA, *August 11, 1898.*

TRIESTE.

Trieste is a city of about 165,000 souls, but it is still without sewerage in the modern sense of the word, and is far from having the latest or most sanitary methods of disposing of garbage and waste.

There is a movement on foot to adopt a modern sewer system, but it will probably be some time before anything definite will be decided upon. If the present report is of any interest to American sanitarists, it is because it may explain the high death rate of this city (33 per 1,000), and be a warning against the adoption or continuance of mediæval systems for disposing of sewage and offal.

All waste is removed from this city by contract, the present contractor receiving annually from the municipality a consideration of 62,400 florins ($25,330) for his services. He furnishes all the men, horses, tools, carts, pumps, etc., necessary to do the work "in a decent and efficient manner." All the rubbish, garbage, and sewage removed by him are his perquisite, and he is furthermore paid separately for emptying cesspools or closet vaults, the expense of which is borne by the individual house owners.

It is the contractor's duty to cause all the streets of the city to be swept and, when necessary, sprinkled twice a day, and to have the garbage and waste bin of every house emptied at least once a day. The force employed for these purposes numbers 120 men, who gather on an average 50 cubic meters (1.765 cubic feet) of sweepings and garbage per day.

Nearly every house has a large vault or cesspool into which the various closets empty, and the vaults of some of the older houses have overflow pipes connecting with the drain sewer. In these vaults, the solid excrements are often permitted to accumulate for years. For emptying them, the contractor is paid 4.50 florins ($1.83) per cubic meter (35.3 cubic feet). A 10 per cent solution of sulphate of iron and carbolic acid is poured into the vault; the contents are then stirred and pumped into a closed tank. When the tank is full it is taken to an island near the city and emptied. To this place are also taken all the street sweepings, as well as the garbage and other rubbish collected from the different houses. The material thus accumulated is mixed indiscriminately, and is allowed to decompose or ferment till the following spring, when it is sold to the peasants of the surrounding country at a price ranging from 1.50 to 1.70 florins (60 to 70 cents) per cubic meter.

Rubbish of a refractory nature, as tin cans, broken glass, and crockery, is collected separately, but is also taken to this island and used for the purpose of regaining land. The present contractor has granted to a charitable society, called "Previdenza," the right to pick out from the piles of waste on the streets paper, glass, rags, and whatever other material that can be turned to account.

The waste from the few manufacturing establishments within the limits of the city must be removed by the contractor. The factories located in the suburbs, however, are compelled to dispose of their own refuse, which, as a rule, is dumped into the sea. The public market places must be kept clean by the contractor, and must be swept at least once a day.

The slaughterhouses are under the direct control of the city, which has assumed the responsibility of disposing of all the refuse. The blood is used chiefly for the manufacture of albumen. Other wastes are in part turned into fertilizers, but a large portion is allowed to become a public nuisance, contaminating both air and soil.

All animals that have died by sickness or mischance are removed and cremated at the expense of their owners by the public flayer, whose fees are regulated by a city tariff. If such animals have not died of contagious diseases, their hides, fat, etc., may be utilized, being the perquisite of the flayer.

Trieste is not without sewers, and most of the houses have kitchen drains and some have "overflow pipes" connecting with them, but these sewers, it is generally conceded, produce more evil than good, for the following reasons:

(1) They can not be flushed, and thus become a source of contamination to the very houses with which they are connected.

(2) They empty into the sea at the water front, which forms the border of one of the principal streets of the city, sending forth pestilential odors, obnoxious to passers-by, and still more so to those who have their permanent abodes in that portion of the city. The further construction of sewer connections for the conveyance of excrementitious matter is now prohibited, but as long as the overflow pipes are permitted to do their nefarious work, the sewers will continue to be what they always have been—a public nuisance and abomination.

FREDK. W. HOSSFELD, *Consul.*

TRIESTE, *May 10, 1898.*

BELGIUM.

ANTWERP.

Since the Liberal party has been intrusted with the control of the affairs of the city—that is, for more than twenty years—most of the municipal departments have been reorganized, improved, and extended. This is true of the department charged with the cleaning of the public streets, sewers, etc. In 1872, the headquarters of the department were located at Rue des Prédicateurs, No. 18, and consisted of a stable for 48 horses, a blacksmith's shop, and a wheelwright's tumble-down shed. These accommodations were absolutely insufficient for the requirements of the service. Hardly had the party named taken office than it appropriated the funds necessary for the improvement of the quarters of the department. In January, 1873, the common council approved the plan for the construction of a new stable for 26 horses, a blacksmith's shop, and a saddlery. By reason of the considerable increase in the population of the city, it became necessary in 1878 to construct a branch establishment in the northern section. This establishment was provided with a stable for 30 horses and workshops necessary for the ordinary repair of implements used. Notwithstanding this important addition, the quarters once again proved insufficient.

Since the abolishment, in 1875, of the dues for the emptying of cesspools, the commissioners have been repeatedly obliged to increase the number of men forming night squads, first from 6 to 8, then from 8 to 12, and then from 12 to 14, in consequence of the large quantities of water that people emptied into the sewers. More room was required in Rue des Prédicateurs to stable horses, put up machinery, etc. This branch of the service soon became of such importance that it demanded an entire reorganization of the service on a new footing.

In 1882, the office was enlarged in order to conveniently accommodate the employees required to keep the books and do the necessary writing. Simultaneously with this improvement, plans were elaborated for the condemnation of the buildings situated behind the school of the Rue de la Ferme, so as to appropriate the land for the necessary extension required by the main building. The condemnation was effected in 1883 and the work commenced in 1884. This comprised a stable for 38 horses, an infirmary with stalls for 11 horses, a storehouse and sheds for the implements and tools.

The expenditures amounted to about $51,145 for the land condemned and to $17,370 for the building erected. In 1888, the common council voted a special appropriation of $57,900 to place the department of public health in a position to enlarge its branch division and to enable it to have constructed in both places additional covered sheds to store paraphernalia, daily becoming greater. Nothwithstanding these several alterations, at present the stables of the main premises are being enlarged so as to accommodate the 12 horses purchased for the working of a recently acquired number of cesspool-cleaning carts. In addition to these improvements, the common council has recently voted an appropriation of $19,300 for the increase in number of boats, and for the purpose of buying a plot of land in the heather land district, to serve as a place of deposit for the street mud remaining unsold.

The department of health is divided into bureaus charged with the following duties: (1) Disposal of sewage and refuse; (2) sweeping the streets; (3) watering the streets, avenues, and public squares; (4) overseeing and disinfecting all alleys, courts, etc.; (5) washing and disinfecting the urinals; (6) cleaning and disinfecting the foul-air valves or siphons; (7) cleaning and disinfecting the sewer holes, slides, and all spots where filth may be deposited; (8) disinfecting apartments, inland boats, or any seagoing crafts contaminated by any infectious disease; (9) depositing fecal matter and filth when collected; (10) loading and transporting fecal matter and city refuse by rail and by boat.

The two establishments are located, the principal one in Rue des Prédicateurs, and the second in Rue d'Autriche. The stables of the first contain 127 horses, those of the second 32. The principal establishment has a storehouse and sheds for vehicles, with shops for wheelwrights, blacksmiths, saddlery, sailmaking, and painting purposes. The branch establishment consists of a wheelwright's shop, a blacksmith's shop, and a saddlery.

Sewage.

The emptying and cleaning out of cess vaults is done each day by the Talard system, of Paris. Five pneumatic steam pumps and 25 two-horse cylindrical vans, of a capacity of about 793 gallons each, are employed. This machinery is manipulated by five gangs of men, comprising each an overseer, a machinist, 4 workmen, and 5 drivers. The use of the Talard system dates from 1883. Before this period such work had been performed at night, and bellows pumps or pumps of the Duden system had been employed, both being worked by hand. The number of men required was comparatively greater, and was made up of fourteen gangs, comprising each 1 head nightsman, 4 workmen, and 3 drivers, with receiving vans dragged by horses.

Night service was the cause of much unpleasantness to the inhabitants of the city; everywhere on their way these vehicles polluted the air, giving rise to constant complaints. All this nuisance has been avoided by the adoption of the Talard system, which as regards shortness of time required to fill the receivers, and cleanliness, can be considered as perfect of its kind. The present system has materially contributed to bettering the sanitary state of the city. The communal authorities have thought well not to hesitate in making the large outlays necessary for the purchase of the Talard sanitary system, when the object to be attained was so important.

The amount of fecal matter collected annually is, on an average, 21,134,400 gallons. Nineteen sailboats, the property of the city, of an average capacity of 18,493 gallons, are employed in the transport of this refuse. Besides the system of transportation by boat, there is also one lately adopted, by means of cistern freight cars, to fill the numerous orders coming from agricultural districts through which a railway passes. Ten of these cars are already doing this class of service.

A noteworthy improvement has been effected in the examination and lighting of cesspools. Formerly, the primitive style of lamp with a wick was in use, which caused at times accidents through the flame coming in contact with the inflammable gases these places contained, giving rise to fire or explosion. To prevent the occurrence of like catastrophes, the commissioners sought for a safety lamp. That used by the Belgian and English miners, as well as an electrical lamp, were tried. The first gave insufficient light, and the second, not being fed by the air of its surroundings, failed to become extinguished in a vitiated atmosphere, making it obligatory to use a lamp with an open flame in cases where deep examinations of the cesspools became necessary. One of the employees, named Verschuren, conceived the idea of applying to an ordinary Belgian petroleum lamp the system of the miners' lamp, producing in this manner a lamp possessing all the requisites. This not only does not ignite the inflammable gases, but has the advantage of extinguishing instantly in foul air; further, it has a very great light-giving power, gives no smoke, as the wick lamps did, and consumes petroleum.

On the boats with the Talard system, a lantern was placed over an opening arranged in the form of a funnel in one of the hatches, through which funnel all the gases generated in the vessel passed and were consumed by the flame of the lantern. This system, however, was very defective, as the flame went out each time that the loading was done too rapidly. This has been remedied by suppressing the lantern and connecting the receiver direct with the boat by means of a suction pipe. The gases generated in the boat are drawn into the receiver and there collected during the process of loading. When this is accomplished, the receiver is connected by means of the same suction pipe to a pneumatic steam pump, which in turn exhausts the receiver of foul gases, driving them into the machine's furnace to be there consumed.

Street sweeping.

The city, as regards the sweeping of its streets, has been divided into 16 districts, each of which is served by a gang of men composed of a foreman and 7 sweepers; these, again, are under the supervision of 2 overseers. Populous sections, with thoroughfares through which street cars run, are kept clean by a gang of 70 men supplied with wheelbarrows. Their line of work includes the removal of garbage from dwellings by carts. Garbage carts go their rounds but once a day. Formerly, when these had passed, people were obliged to do one of two things—either to allow garbage to remain in their houses for twenty-four hours or to throw it in the street, thereby risking fines at the hands of the police. This filth was obliged to remain uncollected until the passage of the cart the next day, an infectious and pestilential mass. This dangerous state of things came to an end when the barrow men were employed. Each barrow man has but a limited number of streets to attend to. His work consists in removing continually all the refuse deposited in the street, putting in his barrow all household detritus, cleaning and disinfecting with sulphate of iron the openings of the sewers, conduits, etc. He empties his wheelbarrow in some isolated spot in his district, and the heap so formed is taken away by the passing carts before decomposition has had time to develop. Twelve small structures of iron, destined to receive the offal gathered by the men, have just been built. If this experiment answers expectations, each district will be furnished with similar ones.

As regards the taking up of ashes and garbage from the houses, the city is subdivided into 41 districts, more generally called "turns," each turn or round furnished with a cart, a conductor, and a female sweeper. The old carts with two wheels have been replaced by four-wheeled wagons. These are closed and have a capacity double that of the others. The employment of these new vehicles constitutes a marked improvement in the way of economy as well as in that of hygiene and cleanliness. The sides of the covers when opened are provided with a guard, to prevent the dust made while turning out the filth from incommoding passers-by. All street offal with household garbage is put in boats or on cars; the amount yearly collected being estimated at 150,000 cubic meters (5,315,000 cubic feet).

Watering of the streets.

The watering of public squares and thoroughfares is performed by a gang of 24 workmen, each being furnished with a standpipe and hose apparatus running on wheels. The watering of the streets is done by special wagons provided with large metal casks, containing the water which is forced into the sprinkling pipes. These vehicles are 34 in number and each is drawn by one horse. The method of distribution of water everywhere in the city is of such a nature as to allow the public thoroughfares to be watered on a large scale. It is performed on the boulevards by men called "fountaineers," provided with pipes and hose, and in the streets by the watering carts.

Narrow streets and alleys.

The narrow streets and alleys, numbering 445, are daily gone through by the men with barrows, who are charged with the cleaning out and disinfection of the water holes and with the clearing out of the sewer conduits. Once a week the sweepers undertake a thorough flooding of them all.

Urinals.

The cleaning and disinfection of the urinals, numbering in all 350, is done twice a day the whole year round by 9 women and 1 man, whose special duty is the removal, with spirits of salt, of all the yellow deposits that develop after a certain time on the surface of the urinals. These employees are under the supervision of an overseer. Since 1885, many of the urinals have been furnished with apparatus fitted to clean them by a constant flow of water. This permanent washing prevents all fouling. For disinfection purposes "Jeyes" creoline is employed, being considered the best material.

The foul-air valves and siphons connected with urinals, about 3,500 in number, are cleaned out in winter during daylight and in summer at night. The contents are first disinfected with chloride of lime, and when the process of emptying has been completed, the bottom is also covered with this same disinfectant and the recipient filled with clear water. This work is done under the supervision of an overseer, 7 four-wheeled mud carts and 2 vehicles carrying water, called "tons," being employed. For hygienic reasons, troughs of galvanized iron have been substituted for the wooden ones formerly in use.

Methods of disinfection.

Disinfection is done in apartments, on board inland boats and sea-going craft that are reported by the health officers to be contaminated by an infectious disease. The apparatus employed consists of two steam generators, several pulverizers, and the necessary instruments to work the Pictet system now in course of trial. The steam generators serve to disinfect wearing apparel and bedding by means of hot vapor, and the pulverizers to disinfect apartments and the interior of vessels by corrosive sublimate.

The Pictet system of disinfection consists of driving into interior spaces, hermetically closed, a certain liquid compounded by this savant which vaporizes on contact with the air, producing a gas which destroys microbes. This is confined in the premises twenty-four hours.

Articles of bedding too dirty or too much used to be disinfected are consumed by fire and replaced by the charity board.

The employees comprising the disinfecting corps, the number of whom is determined by circumstances, wear while at work clothing which is impenetrable and is regularly disinfected, and after their day's labor they take a bath. For this purpose, bathing facilities have been arranged in the main building.

Other measures concerning public health.

The following-named hygienic measures are adjuncts in the service of public cleanliness, and complete the list of those already mentioned:

All machinery, implements used for cesspools or for the sweeping of the streets, are cleaned daily, but on Sundays before noon are washed by means of copious flooding of water.

Each cess van employed in the transport of filth is supplied with a trough filled with chloride of lime, to enable the driver to disinfect immediately any substances in decomposition that he may be called upon to put into his vehicle.

All places where public cabs and carriages are stationed are washed and sprinkled daily with a mixture of "Jeyes" creosote and pure water. The gutters along the edge of the curbstones are daily cleaned and then disinfected. Twice weekly, water from the city's supply is allowed to flow over them, after which they are once again disinfected. When, as a result of these repeated washings, the interstices between the paving stones are cleared of earth, men scatter ashes over them to fill in the crevices. The lowlands of the city, which temporarily serve for the purpose of dumping detritus and rubbish of too poor a sort to be devoted to fertilizing purposes, are disinfected twice daily, morning and evening, with raw lime, and twice every week with a solution of chloride of lime or of sulphate of iron.

A man from each batch of sweepers is specially charged, after a prior cleaning of them by the entire brigade, to disinfect all the corners, recesses, slides, sewer holes, and approaches to vacant lots and terraces. During the summer, there is added to each brigade of sweepers a batch of men whose special duty it is to wash out, by means of plentiful streams of water from their hose, the conduits and sewer holes, and to disinfect them afterwards with raw lime, this process counteracting all the unhealthy miasmas that might arise and spread from them.

From the 1st of May until the 1st of October of each year, the board of managers provide for the use of the workmen a cooling drink, consisting of a decoction of root licorice and sulphuric ether in the proportion of 1 gram of ether (a little more than 15 grains) to 1,000 grams of liquid (1,500 grains). This beverage, pleasant to the taste, is an innocuous preventive of colic and diarrhea, and its use is beneficial to the men.

It is generally admitted that the germs of typhoid fever have their origin in the infiltrations of fecal matter into drinking water; at least, analysis of the water has established this fact in nine cases out of ten. The cesspools, the openings of which allow passage for a man, are minutely examined after each cleaning out to ascertain if they have not some flaw or defect in construction favorable to the escape of fecal matter or its infiltration into the water for drinking purposes. Cesspools are further examined to see if they are built according to regulations and afford all security demanded.

Disposal of street refuse.

The city of Antwerp gets rid of the mud daily collected on the city streets by selling it in part to farmers and by employing the surplus for fertilizing heather moors, that cover large areas of ground in the suburbs of the city. The quantity collected annually can be estimated at 130,000 cubic meters (4,589,000 cubic feet). Of this quantity, 60,000 cubic meters are at present sold, and produce $15,440 profit to the city, the balance, 70,000 cubic meters, being employed to transform unproductive heather land into good fertile ground. The transportation is accomplished in part by rail, viz, about 6,000 cubic meters; the remainder, 124,000 cubic meters, by boats.

The city does not clear the heather land, but limits its efforts to covering it over 17.55 inches deep with street mud, and this again with a layer, 3.90 to 5.85 inches deep, of the earth found on the spot. When this mud has thrown off what is termed its "wild oats," that is, when it has ridden itself by fermentation of the marsh gases it contains in abundance, it is sown with grass seed which produces hay of the very best quality, bringing at public sale $115.80 per 2.47 acres. An attempt made last year to raise forage, beet roots, obtained $72.37 per acre.

The city owns a tract of land of about 61.75 acres, which was purchased at the rate of $53.25 per acre, extending 1,312 feet along the canal of St. Job in 't Goor, by the side of which runs a suburban steam tramway, and another tract of 370.50 acres, wholly wooded with cedars and acquired by accumulated purchases at public auction at the price of $15,440. This outlay is covered by the value of the wood on the land. It fronts the same canal to the length of more than 3,280 feet. By the means of a branch 6,560 feet in length, the steam railway may be employed for all transportation purposes. In winter, when the canal is often closed by ice, resort is had to the tramway to carry the mud.

The cost of the sweeping and removal of the mud within the precincts of the city is impossible to ascertain, because no special record is kept. The transport, which is accomplished by boats belonging to the city, costs about 13 cents for each cubic meter (35.3 cubic feet), cost of hauling the boats included. The refuse is sold at the average price of 29 cents per cubic meter, the unloading being at the expense of the buyer. The costs of transport, hauling, discharging, and leveling (including drainage of the land) of the mud destined to cover the heather amounts to about $482.50 per acre.

It is to be remarked that these waste lands, covered on the surface with 17.55 inches of manure, furnish good crops during at least ten years without further outlay.

In Antwerp, the authorities are not in favor of the method of destroying the city's offal by means of incineration, on account of the city's location being such as to admit of an advantageous use of its refuse for the general purpose of agriculture, as well as for the reason that incineration or the destruction of offal by distillation entails considerable expense and leaves a residuum which is difficult to dispose of advantageously.

GEO. F. LINCOLN, *Consul.*

ANTWERP, *May 19, 1898.*

BRUSSELS.

The city of Brussels, exclusive of its nine suburbs, covers an area of 759 hectares (1,878 acres), and has about 150 hectares (371 acres) of public thoroughfares, as follows: Four hundred and eighty-three streets, 208 alleys, 41 public places at intersection of streets, 16 boulevards, 10 quays, 4 chaussées (causeways), 32 avenues, 3 parks, 5 covered passageways, 7 arcades, and 4 citis or sites, surrounding model tenement houses.

NATURE OF MATERIAL COLLECTED.

In addition to the waste of animal and vegetable foods, the material collected consists of street garbage, waste from houses, refuse from abattoirs and fish and vegetable markets. The amount annually collected is about 100,000 cubic meters (320,000 cubic feet), or about 80,000 tons. This is gathered by city scavengers under the supervision of the street-cleaning service. The work is done by the city, and the cost of collection and disposal is incorporated in the amount appropriated for the maintenance of the street-cleaning service, which latter annually costs the city about 574,364.59 francs ($110,852.36). The amount spent for collection and disposal of garbage is 117,625.34 francs ($22,701.69), and the sale of garbage brings 49,723.50 francs ($9,596.63). In several suburbs of Brussels and in towns in this consular district the work is done by contract, and the refuse sold to farmers as fertilizer.

In the city of Brussels, the inhabitants are compelled to keep a receptacle for all household waste, which, according to an ordinance, must be placed on the sidewalk belore 8 a. m., daily, during summer months, and before 9 a. m. in winter. The boxes are immediately visited by the ragpickers, who rake them over carefully, selecting articles that may be profitable to them. The refuse is then collected by the scavengers, who in turn rake it over for bits of old rags, iron, bones, etc., that may have escaped the eye of the ragpicker. The city sells the garbage to middlemen, who dispose of it to farmers. When, however, the accumulation exceeds the demand, it is loaded on canal boats and towed to Neder-Over-Hembeek, about 3 miles from the city, and deposited upon waste land known as the garbage farm. Records of this city show that the first mention of the disposal of garbage was in 1560, when it was decided to make an excavation on a vacant lot then without the city limits for the reception of waste and garbage. This locality was used for this purpose as late as 1845, when, owing to the extension of the city limits and the recent construction of the customs-house, the necessity of a change was recognized. It was not effected until 1853, when the present dumping ground was decided upon.

SYSTEM OF COLLECTION.

The system in use for years previous to 1853 was by contract to the highest bidder, and returned a profit to the city varying from 10,000 to

26,940 francs ($1,930 to $5,199.42) per annum. In 1855, this system of collection was interrupted, owing to important works on the canals traversing the lower part of the city. It was then decided by the municipal council to have the work done by the city. During several succeeding years the city derived considerable benefit, until the construction of improved sewerage, when the work was performed at a loss. In 1866, the collection of garbage was once again made by contract, for which the city annually received 81,000 francs ($15,633). In 1871, at request of the contractor, the arrangement was annulled by the communal council, and since June, 1872, the work has been performed by the city under the supervision of the street-cleaning service.

WATER-CARRIED SEWAGE.

The sewerage system in use in this consular district is the ordinary one, flushed with water, and has been in operation since 1848. The sewage, as above stated, is not collected.

HOUSE DRAINAGE.

Excepting a very small percentage, the houses in this city are drained by private pipes connecting with the street sewers. Almost the entire bulk of the city sewage is carried by the two main connections into the great sewer just beyond the city limits, a distance of 5 miles, and finally discharged into the river Senne. The solid matter is not separated from the fluid. The small amount of sewage not disposed of in this way is collected and distributed on the waste land above described. The city derives no revenue or benefit from the utilization of the sewage employed for this purpose. The cost of disposing of the sewage is included in the annual expenses for repairing, cleansing, and disinfecting the sewers.

STREET SWEEPINGS.

The streets of Brussels are daily swept by 227 men, provided with hose and rude brooms made of small twigs. Usually two men are detailed at fixed posts. They water and sweep the roadways, collect the sweepings, which are put into piles and removed by the scavenger wagons, making three rounds daily. The sweeping is done principally by hand, and accessorily by sweeping machines drawn by horses, which perform this part of the work invariably at night. The work is so arranged that even in the busiest thoroughfares and most densely populated sections of the city the streets are kept admirably clean and in excellent condition. The work is done by the city.

The streets are paved with Belgian blocks; boulevards and avenues with asphalt and wood. In 1891, after an investigation made in England, the communal council voted in favor of the construction of a trial furnace for the purpose of cremating garbage, and in the same year a furnace with two cells was constructed in one of the suburbs of Brussels, near the canal. The principal object in building the furnace was to demonstrate that house waste could be cremated without the addition of fuel, and without any inconvenience to the neighborhood. Although the furnace was reported thoroughly satisfactory, it is now rarely used.

ANIMALS.

Dead animals, such as horses, are disposed of by owners, usually by sale. Dead cats and dogs are thrown into the garbage boxes and removed, as well as those found on the public highways by the scavenger carts. Frequently the skins are removed and sold by the scavengers and the carcass incinerated or dumped on the garbage farm.

GENERAL.

The population of Brussels and suburbs is 531,024; of Charleroi, 23,042; of Tournai, 35,905.

I inclose herewith five official publications, as follows: (1) Le Service du Nettoyage de la Voirie; (2) Destruction des Immondices par le feu; (3) Service du Nettoyage de la Voirie, notes diverses sur l'Incinération des Immondices; (4) Réglement général concernant la Police et L'Hygiene de la Voirie et des construction; (5) Réglement pour Le Balaiement des Rues et L'Enlévement des Bones.[1]

GEO. W. ROOSEVELT, *Consul.*

BRUSSELS, *March 26, 1898.*

GHENT.

The methods of collection and disposal of city wastes in this consular district are very primitive. Little attention has been paid to the subject, and public interest in the matter is unappreciable. With a view of determining the exact conditions existing, inquiries have been made of mayors of the respective cities, as follows:

(1) What is the quantity of refuse collected in your city and of what does it consist?

(2) How is this refuse collected?

(3) What is the cost of the system? Is the work done by contract or by the city?

(4) What disposition is made of the refuse?

(5) Describe the method employed for disposing of it. How long has this system been in force? What was the method formerly employed?

(6) Is the matter burned or what other use is made of it?

(7) What is done with old cans, bottles, glass, crockery, ashes, sawdust, floor sweepings, paper, and other rubbish?

(8) What disposition is made of kitchen, laundry, and chamber waters?

(9) How are excrementitious matters collected?

(10) What system of sewerage exists? Is it combined or simple?

(11) Where do the sewer waters empty?

(12) Are there establishments which produce products manufactured from the wastes? What are the official regulations governing them?

---

[1] Sent to the Department of Agriculture.

(13) What system is employed for the disposal of market and abbattior refuse?
(14) What disposal is made of dead animals, such as dogs, cats, etc.?
(15) What is the cost? Is any use made of these carcasses?

A copy of the foregoing interrogatories was sent, with an explanatory letter, to the mayors of Ghent, Bruges, and Ostend respectively. I give their replies below, literally translated, prefaced by a few brief preliminary remarks of a general character.

Ghent is a city of 161,125 inhabitants, containing many manufacturing establishments, in which a very large percentage of its population is employed. The total number of houses is 33,138, of which 1,119 are unoccupied. The factory hands reside for the most part in the so-called "inclosures." Of these there are 627, with 7,586 houses (455 unoccupied), occupied by 7,429 families, or 28,664 persons. Generally the houses in each inclosure have sanitary arrangements in common.

The soil on which the city is situated is sandy and porous; there are a few slight slopes and one elevation varying from 50 to 100 feet, but the greater part of the city is only slightly above the level of the sea. There is water communication with all the principal cities of western Belgium and northern France. The port of Ghent, on the northern extremity of the city, is connected with the North Sea by a deep-sea canal—the Cerneuzen Canal—which has a length of some 20 miles. The surrounding country is extremely flat, and chiefly devoted to agricultural purposes. All city streets here, as elsewhere in Flanders, are paved with Belgian blocks, the stones being about 2½ by 3 by 4 inches.

In reply to my interrogatories, the mayor of Ghent wrote:

1. The quantity of refuse matter collected is 0.049434 cubic feet (0.0014 cubic meter) daily per inhabitant.

2 to 7. The inhabitants put their household garbage in boxes, which they place at the front door of their residences every morning. These boxes are emptied by the manure collectors, who go around for this purpose, some with handcarts and others with wagons. This service, as well as the street sweeping, is done by contract, at a total cost of $23,439.21 per year. The sweepings are mixed with such household garbage as can be used for fertilizing purposes. The product thus prepared is sold by the contractor on his own account for agricultural usages. For this purpose there is at Vinderhoute—1 league distant from the city, in the open country—a depot to which the rubbish is transported by canal boats. These latter collect it from the wagons at three different points in the city, where special landing places have been built. Household wastes, such as ashes, broken glass, etc., which can not be used for fertilizer, are employed to fill up low lands. In this respect, the contractor must conform to the following regulations: (1) The débris must be covered with a layer of arable earth at least 19¾ inches in depth. (2) The débris must not approach any habitation nearer than 55 yards. (3) The land filled in must be inclosed by a fence. (4) Such land can be used for buildings only after the expiration of two years.

No furnace for cremation exists.

8. Household waste waters are carried off by house connections with the public sewers.

9. Excrementitious matter is collected in cesspools, which, by the regulations recently voted, are to be emptied in the future only by deodorous processes and by means of an absolutely water-tight apparatus.

10. In each street a sewer in masonry exists. The dimensions vary from 15¾ to 23⅝ inches in diameter for the circular sewers and 31½ to 47¼ inches for the oval

sewers. These sewers are placed at an average depth of 60 inches below the pavement, and receive only rain water and household waste water.

11. The sewers empty into the numerous water courses and canals which intersect the city.

12 and 13. There are no establishments manufacturing such products.

14. Market refuse, including that of the fish market, is mixed with manure and household garbage. The refuse of the cattle market is removed by the garbage contractor. A contractor pays $328.10 to the city annually for the privilege of removing the refuse of the slaughterhouse. This removal is made at night by special boats.

15 and 16. The cadavers of dogs and cats are buried by the owner at the latter's expense, pending the inauguration of the special denaturalizing establishment in connection with the slaughterhouse. The carcasses of other dead animals are burned by the city, the costs being paid by the owner at the rate of 96½ cents for each animal or half animal, except pigs, sheep, and goats, for which the charge is only 48½ cents.

Such are the conditions existing at Ghent, according to the mayor of this city. In reference to the methods employed for the collection of garbage, some details of personal observation may be added. There is no special can or box employed for its deposit in the street; any old receptacle is used. The wagons by which it is collected are also for the most part dilapidated, and when in use are frequently overloaded, so that considerable quantities are dropped in the public thoroughfares. The places at which such garbage is deposited in the canal boats are not provided with any apparatus for its transfer from the wagon to the boat, and consequently the foul odors arising therefrom are unbearable and a menace to public health. In the case of houses unconnected with public sewers, waste waters are often thrown into the street gutters or canals. Further, the methods heretofore employed for the emptying of cesspools have been antiquated. All this work has been done by private enterprise. The apparatus has consisted of iron tank wagons, rubber hose, and hand or steam pumps. Two or three times per year the service has been performed from house to house. The presumption is that it is gratuitous, but as a matter of fact, it has in recent years become practically impossible to secure any one to pump out a cesspool without paying a price, in many instances extortionate. The method of operation is to place the tank wagon in front of the door, to connect one end of the hose therewith, and, passing the hose through the hall, place the other end in the cesspool. The pump is then set in action, and the contents of the pit are transferred to the tank wagon. This process fills the house with foul odors. Moreover, running water can never be used with these pits, as they are without sewer connections.

The excrementitious matter is subsequently emptied into boats and transferred to a depot in the country. These iron tank wagons, however, have always been inadequate for the needs of the city. Most of the cesspools in the poorer quarters have been emptied by farmers, coming in the night time with small wooden tank wagons to carry away the excrementitious matters. They empty the pits by means of hand pails.

It is to be hoped, therefore, that the resolutions taken by the municipal authorities, and to be put in force from July 1 next, will result in an amelioration of the sanitary condition of the city.

Bruges is a city of 50,000 people, practically without manufacturing industries. It is situated on very low sandy soil, about 10 miles from the sea. There are many canals, of very little importance for trade because of their small dimensions. A deep sea canal is, however, in course of construction. The dwelling houses are for the most part very old. A few years ago Bruges was termed a dead city, although more recently it has shown many signs of reawakening.

The mayor of Bruges replies as follows to my inquiries:

1. It is not possible to determine even approximately the quantity of refuse. It consists of manure, household waste, old crockery, straw, and generally everything accumulating upon the public highway.

2. By contract.

3. The average annual expense to the city is $4,439.

4 and 5. Manure and street sweepings are carried away by wagons to the depots established for this purpose, situated outside the city and more than 300 yards from any group of houses.

6. One of the contractors burns it; the other employs it for fertilizing the soil.

7. All these articles are burned.

8. Kitchen and laundry waters are carried off by public sewers; chamber water is thrown into the cesspool.

9. Excrementitious matter is collected by workmen of the sewage farm and by two or three aged peasants.

10. For rain and household waters only.

11. In the canals.

12. No.

13. No answer.

14. They are buried.

15. None.

In Bruges, many of the water-closets empty immediately into the canals. In other instances, the receptacle of the vehicle employed for the removal of excrementitious matter is of iron or wood, as at Ghent.

Ostend is a city of 30,000 inhabitants, situated on the seacoast; is a much frequented summer resort. During the season—July to September—it receives about 40,000 visitors remaining more than one day, while several hundred thousand visit it on day excursions only. It is well built, has good wide thoroughfares, and a great dike to protect it against the invasions of the sea. In all ways efforts are made to render the city attractive and healthy. The proximity of the sea naturally facilitates these endeavors.

The mayor of Ostend replies as follows:

The incineration of refuse is not yet in force in Ostend, but the municipality has decided to adopt this system at an early date. The removal of all refuse is at present effected by means of carts, which convey it to some distance from the city. It is partly sold to farmers and partly employed by the city to fertilize its own lands.

From my own knowledge, I may state that the removal of excrementitious matter is effected by a similar system as in Ghent, except that the entire apparatus employed therefor is deodorous and relatively modern.

The methods employed in other cities and towns of this consular district for the disposal of garbage, sewage, and other refuse are certainly not more modern than those described. They are therefore without interest. The conditions existing at Bruges are a fair type of those to be found in other towns.

Ghent and Bruges are the two largest cities in this district, while Ostend is only slightly exceeded in population by two or three cities not mentioned; but the latter are not nearly so important from the foreign point of view. To specially describe their antiquated system would be without interest or utility.

In general, it may be stated that the details suggested by the Department to which replies have not been given or reference made in this report are unimportant in this consular district. From the statements herein made, it is evident that much can be done by the municipalities of Flanders to modernize the methods in vogue in the treatment of garbage, sewage, and other wastes.

HENRY C. MORRIS, *Consul.*

GHENT, *April 2, 1898.*

DENMARK.

COPENHAGEN.

I regret to say that the result of the very careful investigations I have made can not be of any special interest to the Department, as the disposal of garbage, sewage, etc., in this city is not effected by any modern scientific methods.

The city of Copenhagen proper has 351,000 inhabitants and is divided into 87 districts. The garbage does not differ from that collected in all large cities, and no statistics as to the amount of material collected are available.

The Copenhagen streets are cleaned partly by the employees of the municipality; partly by inmates of the poorhouses strong enough to perform the work. The refuse, after having been collected, early in the morning, in many small heaps, is carted away to places outside the city designated by the municipality, and this work is done by contract. The contractor and his employees are under supervision of the police. A guaranty for the due performance of the contract must be deposited. Contracts are generally made for one year only. Snow and ice are collected and carted away by special arrangement, at so much per truck load.

The Copenhagen municipality sent out, in 1885, a commission to study the disposal of garbage in England, and in 1888 one was sent to Berlin, Hamburg, Dresden, Frankfort-on-the-Main, Wiesbaden, Strasburg, Cologne, Kiel, and Paris; but the different methods could not be introduced here, owing to the enormous expenses connected with the change of system. In 1895 (no later statistics are available) the municipality paid 374,363 kroner ($100,329) for the removal of garbage.

Excrementitious matter.

I beg to refer to this consulate's report of November 9, 1894 (printed in Consular Reports, vol. 47, No. 173, p. 190). I have only to add that in several of the newer houses, the water-closet system has been introduced. There is, however, a yearly tax of 100 kroner ($26.80) for every seat, which is considered prohibitory; and as the water-closet system is not compulsory, only the very wealthy avail themselves of the permission. I am informed that the Copenhagen hotels are going to introduce the water-closet system, in view of the increasing tourist traffic, all foreigners complaining of the prevailing tub system.

Market and abattoir refuse.

The Copenhagen abattoir is a fine establishment; it has been in use since 1880. Statistics for 1895 show that abattoir refuse and dead animals to the amount of 666,003 pounds weight were destroyed in the establishment attached to the abattoir.

JULES BLOM,
Vice and Deputy Consul.

COPENHAGEN, *March 30, 1898.*

FRANCE.

LYONS.

The city has a population of 466,028.

Garbage.

There is no information lodged with the chief engineer in charge of this work as to the material contained in the collections of city garbage, but from personal observation it may be said to be made up of animal and vegetable food waste, ashes, paper, broken crockery and glass, tin cans, sweepings from hall ways and courts, etc. The daily collection is from 420 to 450 cubic meters of matter; 128 one-horse carts of a capacity of 4 cubic meters each are employed. The rounds for collection of garbage are made in the morning of each day, when two men are employed for each cart, and for street sweepings in the evening, when but one man is assigned to each cart. This work is all done by contract. The city for this purpose is divided into six districts or lots. A certain sum is fixed by the city for each, the range being from 18,000 francs ($3,600) to 37,000 francs ($7,440) per annum, and bidders can not go above the sums fixed in each case. The contracts cover a term of five years, and each successful bidder is required to deposit security in the several amounts fixed by the municipality for each district. The security ranges from 900 to 1,800 francs ($180 to $360) and must be given in governments (rentes), in obligations of the city, or in cash. If cash is given, it must be deposited by the contractor with the cashier of the Mont-de-Piété (the Government pawnbroking office), where it must remain until the contract is fully complied with and terminated, at the interest allowed by that establishment.

Each district has its own dumping ground beyond the city limits, and when the débris is deposited there the city authorities give it no further attention. I can not learn whether it is assorted or not; the only information vouchsafed is that it is allowed to remain at the dumps for some months, when it is sold to neighboring farmers for fertilizing purposes.

This method of collecting and disposing of the city garbage has been in vogue for the past fifty years. Prior to its adoption, garbage was collected in baskets and transported on the backs of donkeys.

Waste water from houses, laundries, etc.

This water is all carried into the general collecting sewers and discharged into the Rhône or Saône, according to location. The city is divided by both rivers.

Excrementitious matter.

This is all collected in vaults or cesspools, located usually under the courts of the houses. These vaults are, at stated periods, pumped out by the exhaust system into iron horizontal boiler-shaped tanks, mounted on trucks drawn by horses. It is then transported outside the city limits, where with other material it is converted into solids for fertilizing purposes. This work is also done by contract, several corporations undertaking it.

I have been unable to get any response whatever to letters addressed to the largest of the companies engaged in this work, and am therefore unable to give any information as to cost and profit of the enterprise.

Water-carried sewage.

The sewer system of Lyons is divided into three sections, each distinct from the other, viz:

The center system, which covers that portion of the city lying between the Rhône and the Saône; this includes three collecting sewers.

The right bank of the Saône system, with one collecting sewer.

The left bank of the Rhône system, with one collecting sewer.

Nothing is discharged into the sewers save household waters (kitchen and laundry) and the surface waters of the streets.

Street sweepings.

Machines are not employed for this work; it is all done by hand. The débris is gathered in small heaps by the sweepers, who also are charged with washing the pavements once each day. The removal of the street sweepings is done by the same contractors who collect and remove the garbage. Their rounds for this work are made in the afternoon, when but one man is employed with each team. In the winter season very little of this refuse is collected, the continued wet weather making it unnecessary, and it is washed into the sewers and thence into the Rhône or Saône, as the case may be. Such sweepings as are collected are conveyed to the garbage dumping grounds, described above.

I have been unable to gather any information as to the value of either the garbage or street sweepings collected. The chief engineer can give none, and the contractors will say nothing, except that the value varies.

The contracts for the removal of garbage and sweepings cover the public squares and places in the several districts and the park Tête d'Or, the only public park of the city.

The refuse of the markets is taken away by the same contractor who collects the garbage from the streets, and is disposed of by him in the same manner.

Abattoirs.

There seems to be but very little refuse to be disposed of from the abattoirs, but a description of the methods obtaining there will perhaps be of interest. All the animals butchered are purchased on the hoof by the retail butchers, and by them slaughtered at the abattoir. The butchers utilize only the meat and sell the remainder to the tripe sellers, with the exception of the hide, the blood, and the tallow. For these three products, the butchers of Lyons have organized a company or society of participation; that is to say, these products are sold for the benefit of all, the hides to the tanners and leather dressers, who in turn sell to the saddlers and shoemakers, leather-goods manufacturers, etc.

The blood is sold to the manure dealers, and the tallow, when dry, goes to the soap and candle makers. When the fat is fresh the butchers utilize it for margarine, for the manufacture of which they have a factory.

The refuse sold to the tripiers is divided into two classes, called (1) the "refuse comestibles" for man and domestic animals, such as the liver, lungs, heart, intestines, head, and feet; these parts form the articles of commerce of the tripiers; (2) noncomestibles, that is to say, the hoofs, bones, hair, and horns, which are sold to the several industries that use them, viz, in making brushes, toys, cutlery, etc. Certain of the intestines enter into the stock of trade of the pork butcher.

The city has no interest whatever in any of these products; it collects fees from the butcher, and that is all.

Dead animals.

Cats, dogs, and other small domestic animals are buried in the ground or thrown into the rivers. The carcasses of horses, asses, and mules, being of a certain commercial value, are sold by the owner to the "knacker," who sells them for manure or for any other purpose except for consumption. This industry is subject to an authorized administration, which regulates the manner of its preparation and sale. The sale of horse meat is a large industry, but the subject can not be dealt with in this paper.

An effort is being made to improve or change the abattoir system here, and to that end a commission was appointed to visit other large cities of Europe to investigate the methods obtaining in each. The commission has just returned, and although its report has not been made public, the journals of this morning say that it brought back much of interest on the subject as a result of the investigation.

THOS. N. BROWNE,
Vice and Deputy Consul.

LYONS, *April 12, 1898.*

SUPPLEMENTARY REPORT.

I transmit herewith a report from the agency at Dijon.

It seems to be impossible to get information as to cost and values of the materials collected. The city authorities seem to pay but little heed to it, and the contractors are, as usual, dumb upon the subject.

THOS. N. BROWNE,
Vice and Deputy Consul.

LYONS, *April 29, 1898.*

REPORT FROM DIJON.

[Population, 67,736.]

The garbage, composed of animal and vegetable food waste, ashes, broken glass, house and court sweepings, is gathered by the neighboring farmers, who pay to the city a small sum daily, according to the extent and importance of the district covered. The same methods obtain in regard to the market and abattoir refuse. Formerly, the city paid for this work.

Household waste waters from kitchen and laundry are carried into the sewers.

Excrementitious matter is collected in cisterns or vaults, from which it is pumped out. It is utilized, after treatment, for fertilizing purposes. This work is done by contractors, of which there are two, who pay to the city 3.50 to 4 francs (67 to 77 cents) per ton of matter collected.

The sewage system is ancient, consisting of small branches which carry the surface water into a collector, whence it is conducted into the river Ouche, about 2½ miles below the city.

The removal of refuse of abattoirs is all done by contract, but it has been impossible to get figures or details. The garbage and offal is removed from the abattoirs in water-tight wagons to a warehouse, where it is treated with sulphuric acid. No data are given relative to the character or disposition of the matter after it has been treated.

The removal of dead animals is done by a company and without cost to the city. Such parts as can be so used are made into strong glue and the refuse into a fertilizer.

MARSEILLES.

My first attempt to secure information of a valuable character on the subject of garbage disposal in France was somewhat discouraging, the gentleman to whom I turned for enlightenment sending me this note in reply to my inquiry: "Garbage is one of the finest dishes of the place. Well cooked and nicely prepared, as they do it in the country, it is something very exquisite." Arriving at the conclusion that my well-meaning correspondent was laboring under a misapprehension, I continued my researches with the following result:

For many years, the city of Marseilles and its half million of inhabitants have been at the mercy of a primitive drainage and garbage collection system. The garbage was dumped on waste land in the country, and is still to some extent. It is worthy of remark that the land in question has since become productive and valuable. In 1890, after agitation, the echoes of which are yet heard, a contract was entered into with M. Louis Genis for the construction of a complete drainage system, for some time past in complete working order.

The objects attained by this system are not only simple house drainage, but the removal of garbage and all street collections ordinarily regarded as solids unfit for public sewers. Roundly speaking, this system has cost $2,000,000, and it takes $80,000 annually to operate it. The smallest pipe laid down is 1 foot in diameter, and the main trunk sewer is 16.4 feet high, and so constructed that boats may pass through it or workmen walk from end to end. A portion of the river Durance is diverted into these sewers at the rate of 2,500 liters (656 gallons) per second, and automatic flush tanks are placed at every dead end.

By means of the new Marseilles sewers all refuse matter is carried out of the city, passes under a mountain of solid rock, and is dumped into the sea at a point so far distant and where the current is such that no evil effects are realized. Owing to the topography of the city, it is necessary to provide lift pumps in the lower level, whereby all collections are elevated to the higher and main level, and as solid matter can not pass through the pumps, it is strained out and carted into the country. Elsewhere, however, the sewers are relied upon for complete disposal of all sewage and garbage. As it is manifestly impossible to give to each house a garbage connection, such waste is ordinarily set out on the sidewalks, collected in carts, and dumped into the sewers at the most convenient point. Of the 23,000 structures in Marseilles, only about 2,500 are as yet connected with the sewers, but so favorable have been the results attained that I have the authority of M. Genis for saying that the annual death rate has fallen from 32.5 to 24 per 1,000, and greater success in this direction is expected to follow, as private connections have increased in number.

The details relating to this great public work, together with drawings and valuable technical matter, are forwarded under separate cover for delivery to the Department of Agriculture.[1]

ROBERT P. SKINNER, *Consul.*

MARSEILLES, *May 19, 1898.*

NICE.

The city of Nice has a population of 108,227 inhabitants (census of 1895), not including the very considerable floating population during the winter season, but including the garrison, generally 6,000 to 8,000.

GARBAGE.

The material collected and referred to under the general term of garbage consists of all manner of house refuse and street sweepings, ashes, etc. The quantity collected is about 60 tons per day (21,900 tons per year). The refuse is gathered by a contractor who owns the requisite horses and carts, and who, in virtue of a contract with the municipality, receives for collection and removal the sum of 83,780 francs ($16,169.54) per annum. The contractor in question has informed me that but a very insignificant portion of this promiscuous garbage is sold by him, and this is used as manure for new vineyards and for olive trees. Some horticulturists also use the refuse, mixing it with chemical or natural manure and often with dried leaves and branches, covering the whole with earth and leaving it for weeks or months to ferment, afterwards sifting it and thus procuring a "terreau," or light earth mold, which is invaluable for sowing delicate seeds and for developing young plants in pots. But the greater part, and, to be accurate, I may say nearly all, of this promiscuous refuse is loaded upon barges or scows and dumped into the sea at a distance of about 4 miles from the shore. The cost of transportation to sea and other attendant expenses are borne by the contractor, and of the 83,780 francs mentioned above, 11,360 francs ($2,212) are considered to be for the expense of loading on barges, towing to the sea, and dumping.

---

[1] Forwarded to the Department of Agriculture.

This method has been employed for fifteen years. Previous to that time, all refuse was sent to a dumping ground situated about 3 miles without the town limits, and farmers and peasants were permitted to take what they wished for their own use.

As I have indicated above, the refuse is of a promiscuous nature, including tin cans, broken glass and crockery, sawdust, floor sweepings, paper, remnants of kitchen utensils of various metals, and divers coarse rubbish.

Up to within a couple of months ago all refuse was thrown into the streets after sunset, and a considerable number of ragpickers found a lucrative employment in selecting saleable portions. But, in response to petitions made by numerous persons (principally belonging to the foreign colony of the town), the town enforced the use of what are called "boites Poubelle." These are tin or zinc cases, with a cover, the contents of which are emptied directly into the contractor's carts. The result has been that the selection of materials by ragpickers is no longer practicable, and the contractor informs me that although he is convinced he could make a very considerable sum as a result of the selection of useful parts of the refuse, he can not undertake to do it, not having a suitable dumping ground, and owing to the want of the time necessary for such an undertaking.

SEWAGE.

In the town proper, the houses having sewer connections, waste waters from the kitchen, laundry, and chambers go into the sewers. In the suburbs, where sewers have not yet been built, they pass through tubes and more often cement-lined canals, and are, at a certain distance from the houses, absorbed into the earth.

All matter which goes into the existing sewers descends, by reason of the natural declivity, through pipes to the sea and is discharged therein at a distance of about 100 yards from the shore.

Excrementitious matter also goes into the sewers where such exist, and where buildings have connection therewith. But even well within the town, numerous buildings exist which still utilize the old system of reservoirs built of masonry for the collection of such matter. In such cases, special contractors are authorized to pump the contents at stated hours through sealed air-tight tubes. Their charge to landlords for this service is about 50 cents per cubic meter (35.314 cubic feet). The matter collected is driven in iron reservoirs to special depots and sold for manuring purposes to kitchen gardeners, at the rate of about 2 francs (39 cents) per cubic meter.

The refuse from the markets and the abattoir is included in the contract for the promiscuous garbage treated of in this report. Dead animals are also included in said contract. They yield no profit to the municipality, nor is there any process in use for the industrial or agricultural utilization of such carcasses.

Regarding other places in this consular district, I find that there are no features of the sewage and garbage question worthy of mention. But I should mention that the principality of Monaco has decided to get rid of its refuse by cremation. The Mediterranean being tideless, it was found that the filth was liable to be sent back whenever the wind blew shoreward. A refuse furnace capable of generating a high degree of heat and of burning 32 tons every twenty-four hours has been built, under patents held by the "Horsfall Furnace Syndicate," of Leeds, England, at a cost of about $15,000, and it is now operating to the complete satisfaction of the authorities.

I inclose a copy of the rules and regulations governing the contract under which the garbage of the town of Nice is collected and disposed of at sea.[1]

HAROLD S. VAN BUREN, *Consul.*

NICE, *June 11, 1898.*

ROUBAIX.

Roubaix has 125,000 inhabitants; Tourcoing 73,000.

GARBAGE.

Garbage of every description and all the waste accumulations of a household, such as broken glass, ashes, and tin cans, are put in boxes and set, daily, on the sidewalk before each house. The refuse is collected at the expense of the city. I have been unable to ascertain the cost of this work in Roubaix, although I have applied almost daily for the information since the receipt of circular requesting it. This garbage is thrown with street sweepings on vacant lots outside the town, or put in barges anchored in the canal. It is sold by auction for the profit of the town. During 1896, Tourcoing spent $9,988 for the street-sweeping service, and received $2,085 from the sale of the refuse, a loss to the town of $7,903 during one year.

SEWAGE.

Waste water from the kitchen flows into the city aqueduct. The towns have no sewer system for carrying off excrement, each house having a cesspool. These cesspools are cleaned in Roubaix by a company, at so much per cubic meter. The excrement is then sold to farmers, who use it as manure. In Tourcoing, farmers pay 15 centimes (3 cents) the hectoliter, or 22½ gallons.

Dead pigs and sheep are usually buried in the farms. Dead horses are sent to the slaughtermen, who boil them to extract the grease.

FACTORY WATERS.

The towns of Roubaix and Tourcoing formerly permitted all factory waters to run into a small river that flows into Belgium. This, however, was stopped by the Belgian Government, as the solid material carried in solution was so great as to cause serious inconvenience to that country. The two towns have now laid down pipes for the waste water of the factories. This is carried to the village of Wattrelos, a short distance from Roubaix, where great expense has been incurred in building heating machines and plant. The system of treatment of these waters is this: They are run into large iron tanks fitted with agitators, and a quantity of lime, which varies according to the amount of liquid, is thrown in and the agitators are set in motion for a short time. The agitators are then stopped and the liquid is allowed to settle for about four or five hours, when the water is practically clean, as the solid material has been precipitated. This water is then syphoned into the river, and the mud and dirt that remains in the tanks are heated until they have become solid enough to be shoveled. As much as possible of this dirt is sold for manure; the rest is spread on 70 hectares (169 acres) of ground, that have been bought for this purpose.

---

[1] Forwarded to the Department of Agriculture.

This system of treating waste waters is not regarded as satisfactory, as the labor is a large item and no remunerative opening has been found for the sale of the dirt.

It will be seen from the above incomplete report that there is no proper system of sanitation as yet for these towns.

The chief preoccupation in the mill industry until lately has been to produce saleable fabrics without regard to a profitable disposal of the waste matter resulting from the process of manufacture. Eminent chemists are now experimenting with the soluble matter contained in factory waters. I have no information as yet with regard to the result of these experiments.

W. P. ATWELL,
Commercial Agent.

ROUBAIX, *March 15, 1898.*

ST. ETIENNE.

The town of St. Etienne ranks as the seventh in importance in France, and has a population of 143,000. Being preeminently an industrial city, particular attention is paid to sanitary arrangements.

The distribution of excellent water is very complete. From a vast reservoir, situated about 5 miles from the town and fed by mountain streams, runs an underground canal which, with its efferents, is computed at 126 kilometers (72.29 miles) in length, and furnishes water to the highest floor of every house and to the numerous street fountains, while along the system are placed over 2,000 fire plugs, which also serve for watering the streets and flushing the sewers. These latter form a network underneath the city and have an aggregate length of 33 kilometers (20½ miles). All the household waste water outlets, as well as the water-closets, are in direct connection with these sewers, which carry the refuse to a little stream a short way outside the town, which in its turn conducts it some miles away to the Loire River.

The farms through which this stream runs are irrigated by this fertilizer by simple gravity, no mechanical means being employed in this direction; nor does the town levy any tax, the farmer making free use of it.

The method of removal of the garbage is similar to that employed in Paris, Lyons, and other large cities of the Republic. All the kitchen refuse, ashes, vegetable waste, etc., are placed in small wooden troughs and carried down to the street in the early morning to wait for the dust wagons, which commence their rounds about 7 o'clock. These wagons are forty in number, and each one is accompanied by two men. About 3 o'clock in the evening they return, but this time only for the sweepings of the streets; these latter are entirely paved with granite.

The removal is done by contract and costs $24,000 a year to the city. All the rubbish is carted to a common at one extremity of the town, where the farmers send for it or have it brought to them. As a fertilizer it is much appreciated, especially by gardeners. The cost of a wagonload when taken on the spot is 23 cents, and when conveyed by the contractor from 30 to 60 cents, according to the distance.

TIN CANS, BOTTLES, BROKEN GLASS, SAWDUST, PAPER, ETC.

Tin cans, such as sardine boxes, preserved-meat tins, etc., are picked up by the dust men and sold to the rag merchants here, who forward them to Paris, where they are stripped of the solder, to which a certain importance is given, while the metal is used generally in the manufacture of toys.

The bottles and old paper are also brought to the ragpickers, who ship them off to the glass works and paper mills of the region.

MARKET AND ABATTOIR REFUSE.

All diseased meat, refuse of the abattoir—there is only one here, and this is under the control of the city—and dead animals are brought to a knacker outside the town and converted into fertilizer. The machines for this purpose are simple crushers and secators. This kind of fertilizer is greatly appreciated by the proprietors of vineyards, and the manufacturer told me that he can never turn out enough to satisfy the demand.

The removal of dead animals from the streets costs the municipality nothing, nor does it derive any benefit from it. The work is done by two butchers, who content themselves with the skin, horns, and hoofs for their profit.

In the other chief towns of my district, the same methods prevail as regards the removal of garbage.

HILARY S. BRUNOT, *Consul.*

ST. ETIENNE, *April 7, 1898.*

GERMANY.

AIX LA CHAPELLE.

Aix la Chapelle, Germany, is a city of 127,000 inhabitants, and has many manufactories, principally of woolen cloth, pins and needles. The ground on which the city is built is of a rolling, broken nature. The city is situated in a sort of a depression, there being but one outlet, toward a small stream outside the boundary called the River Wurm.

SEWAGE.

In the year 1890, a system of sewage was decided upon by the municipal authorities and is now nearly completed. The works are so constructed as to carry all waste water, rainfall, and house sewage beyond the city limits. The system consists of main and branch sewers or canals. The mains are 10 feet wide and 8 feet high, with walls from 4 to 2 feet in thickness. The material used in construction of the mains consists of bricks, each 12 by 4 inches in size, perforated with 10 half-inch holes. These bricks are laid in cement, and bottom is flushed in cement.

The canals are constructed of large oval brick tubes, the inside diameter of which is 3 feet by 18 inches. These are set in a cement base. I should judge that each brick or tube weighs 100 pounds.

To cover cost of construction of sewers, city bonds to the amount of 3,000,000 marks ($714,000) were issued, rate of interest being 3½ per cent. Total length of sewerage is 12 miles.

Every house and lot is connected with sewers, for which service each householder is taxed $35.

The construction was performed under the direction of competent engineers, and grades and outlets are perfect, no gases collecting.

The flushes and sinks for gathering fertilizing material are well planned, there being about fifty of the sinks.

The grades are so arranged as to carry all matter to the River Wurm.

The inhabitants of a small village situated on the Wurm, below the outlet of the sewer, have commenced litigation, which is still in the courts. The River Wurm is of a dirty black color, owing to the refuse from tan and dye factories which empties into sewers. No attempt is made to use or control sewage after its exit.

GARBAGE.

The garbage of Aix la Chapelle is collected in the following manner: Each property owner or resident must sweep from the curb to the center of the street, and these sweepings, together with house garbage, including ashes, must be placed in a box at the curb or in rear of premises, so that they can be removed three times a week—on Tuesdays, Thursdays, and Saturdays—by the city contractor.

The contract for garbage collection is let by the city to the lowest bidder, and lasts for six years. In answer to my question, "Does the contractor make money?" a native said, "Oh, yes; they become very wealthy." The garbage is collected by a driver with a large cart. Each driver is paid $2.15 per day of nine hours. If a resident has neglected to have the street swept by the time the cart arrives, he is fined 3 marks (71 cents) by the police, the fine being charged and collected from the servant. The second time this neglect occurs, the servant, as well as the employer, is fined a similar amount. Fines in Germany are collected, and the person fined has little chance of redress.

The contractor hauls all ashes, broken glass, tin, and other refuse to a vacant lot selected by the city, usually outside the limits, where he sells it to poor people for a small amount. These separate it and use the tin cans to make tin plate, the glass for emery, etc.

The streets on which there is much traffic are cleaned daily of the horse litter, and this is sold to farmers for fertilizing purposes. Four men and two handcarts under a foreman form a brigade. These men are paid 26 cents a day. This collecting is done by the city authorities. The amount received for the sweepings can not be ascertained.

The cost to the city last year for street cleaning was 527,000 marks, or $125,426; removal of snow, 4,100 marks ($975.80).

This city is paved with square sandstone blocks, excepting a few narrow streets which are paved with a cement composition. These stones are durable and cheap, and are not destroyed when the street is torn up.

DEAD ANIMALS.

If death is due to accident, the skin, bones, and fat are disposed of to soap factories, tanneries, etc. If death is due to disease, the carcass is buried at expense of owner. Dead animals are removed by a private individual called a "Wasenmeister."

This article is written from information gathered from citizens and from observation. I tried to obtain reports from city officials, but was unable to do so.

FRANK M. BRUNDAGE, *Consul.*

AIX LA CHAPELLE, *April 7, 1898.*

BARMEN.

The city of Barmen has about 130,000 inhabitants. The garbage, consisting of ashes, garbage, and sweepings, as well as all other kitchen refuse, is gathered by certain contractors daily. The cost for the collection amounts to from 2 to 3 marks (48 to 71 cents) per wagonload. The garbage is used for the filling up and leveling of pits and holes. The proprietors of such places receive from 50 pfennig to 1 mark (11.9 to 23.8 cents) per wagonload. It is proposed to have the removal of the material done by the city hereafter, but at present, nothing can be said as to the cost involved. It has also been suggested to burn the garbage.

Vegetable refuse, potato peel, kitchen refuse, etc., is gathered by the farmers to feed cattle.

Tin cans are mostly melted or made into cheap toys. An institution for people suffering from epilepsy at Bethel, near Bielefeld, receives great quantities of tin cans, tin caps from bottles, corks, old pens, used postage stamps, etc., and a good many other little things which might be used for the benefit of its patients.

Bottles found in good condition are employed again. Broken glass is sold to glass factories in wagonloads at about 50 pfennig (11.9 cents) per 100 pounds. Broken stoneware and crockery can not be used again.

Clean ashes are used for making mortar and filling out floor spaces in new buildings; also for repairing roads. Clean boiler ashes are often sold for from 2 to 3 marks (48 to 71 cents) per wagonload.

Sawdust is used for the packing of glassware, crockery, etc.; also for horse bedding and for the manufacture of beer plates.

Sweepings are not utilized.

Paper waste, old books, letters, rags, etc., are bought at 1 mark (23.8 cents) per 100 pounds, and are used in the manufacture of paper. Bones are used for making glue. Old woolen rags, stockings, etc., are made into shoddy.

SEWAGE.

Waste waters from the kitchen, laundry, and chambers are mostly carried directly into the Wupper River.

Excrementitious matter is, wherever possible, carried into the Wupper. In other cases, it is gathered in basins and emptied from time to time by contractors, with the help of steam, air, or hand pumps, and used for agricultural purposes. Certain companies have built large tanks, from which the matter is taken whenever needed.

Horse and cattle manure is sold by contract to the farmers. The stock yards of this city, for instance, sold in one year 1,430,000 pounds, at 8 pfennig (1.9 cents) per 100 pounds. A regular sewage system is not yet in use in the city of Barmen, but is about to be built.

Every house owner is obliged to sweep half of the street in front of his property twice a week. It is projected to have the street sweeping done hereafter by the city. The sweepings so gathered, as well as the water-carried sewage (the latter in summer disinfected), are taken up in carts, built for that purpose, and carried to the before-mentioned dumping grounds. Barmen paid for this purpose, in 1897, the following amounts:

	Marks.	
Cleaning of streets	19,600	= $4,664.80
Cleaning of sewages	32,200	= 7,663.60
Cleaning of public ditches	11,225	= 2,671.55
Cleaning of Wupper River	8,000	= 1,904.00

There are no factories in this district producing waste which could be used for agricultural or sanitary purposes. The waste water of the dyeing establishments is carried into the Wupper, and on account of its acid contents disinfects the river. The waste from the markets is used in the same way as street sweepings.

Vegetable refuse in a state of decay and carcasses of dead animals are destroyed in the Podewil apparatus. Last year, the following were destroyed: Ten horned cattle, 3 sheep, 11 hogs, 13 calves, 1 horse, 697 unborn calves, 2,061 lungs, 1,050 livers, 148 milts, 61 kidneys, 193 hearts, and a large quantity of other decayed meat. Out of this were made 2,228,000 pounds of powder at 6 marks ($1.43) per 100 pounds, and 365,466 kilos (805,706 pounds) of fat, which was sold at 18 pfennigs (0.04 cent) per kilo (2.2 pounds) to candle factories.

Dry leaves from forests and parks are used for stable bedding, and as garden manure after they have decayed.

The foregoing statements in general refer also to other places in this consular district, and especially to Elberfeld, which has about 137,000 inhabitants.

MAX BOUCHSEIN, *Consul.*

BARMEN, *March 12, 1898.*

BERLIN.

In reply to Department circular, I would call attention to a report of Consul-General W. H. Edwards of May 20, 1891, published in volume 36 of Consular Reports, pp. 462–467, on the "Berlin Sewerage Irrigation system;" also to another report from the same pen, dated March 21, 1891, published in the same volume on pp. 116–119, entitled "Berlin Street Cleaning;" also a report of my own, published in Commercial Relations, 1896–97, Vol. II, p. 356. The solution of the garbage question, though to the casual observer it may appear satisfactory, is by no means in the condition in which the residents, the Berlin city authorities, and the inhabitants of more remote districts, whither much of the refuse has been carried, wish to see it. It has not proved nearly as successful, especially in the summer season, as the sewerage and irrigation systems, which in their line give thorough satisfaction.

Supplementary to the report above mentioned on this last-named subject I send, upon special request of the Department of Agriculture, the last two annual reports of the deputation for the management of the canalization works of Berlin,[1] which also cover parts of the suburbs directly contiguous to the city proper.

GARBAGE.

The official regulations are embodied in a full and voluminous code, and as now in existence, compel each house owner to have in convenient places on his premises, and accessible to all tenants, closely covered sheet-iron cases, into which all solid waste material, such as is known under the collective name of garbage, must be placed. The refuse material must be daily removed to localities about 5 miles outside of the city limits, and must not be deposited nearer than 5 miles to the limits of any other town or city. All this has to be done at the expense of the respective house owners, who employ private individuals and associations of teamsters, and these latter in turn barges and railway cars, since the dumping places have become scarce and expensive. The aggregate cost of this removal for the last few years is computed at a trifle exceeding $600,000 for about 1,800,000 inhabitants of the city proper, which contains an area of 23.01 square miles and about 33,000 buildings located on 24,000 building lots. The quantity removed daily is estimated to average, at present, fully 1,000 tons.

---

[1] Inclosures have been sent to the Department of Agriculture.

But this system, for reasons above named and for others, has become irksome to the house owners and unsatisfactory to the city, and the authorities contemplate taking the matter in hand, giving out the contracts to burn or otherwise dispose of the material, and covering the expense by direct taxation.

With a view to the final disposition of all such material, the city has purchased in parcels, 15 to 20 miles from its limits, low-lying lands to the extent of about 200 acres, which are used as dumping ground.

The city has also expended in the last few years nearly $30,000 in experiments in the direction of burning the garbage, a complete report of which is contained in the book sent herewith[1] prepared by Bohm & Grohn.

A satisfactory solution of the cremation process for Berlin has apparently not been reached, though an able private engineer, Mr. M. Hempel, has invented and patented a furnace which, according to his claims, will do the work completely. (See patent copy enclosed.[1])

There is no doubt that in any city where good coal is burned, as in the large cities of America, in all cities in England, and in Hamburg, cremation is the true solution of the garbage question. Details of some of the main points of it will be found in the enclosed pamphlet[1] on cremation of garbage in Hamburg.

In Berlin and many interior cities a large share of the ashes is from briquets, a compressed artificial fuel, which changes into light, almost useless ashes, making thorough cremation of the other material difficult, in fact impossible, without the use of a quantity of fresh coal. This is doubtless one of the most potent reasons why the city of Berlin has not thus far adopted the cremation system. (See book referred to above; also copy of patent.[1])

With the view of taking city contracts for the removal of garbage, several companies have made estimates and plans, even to the extent of sorting works, but they are reticent as to the modus operandi and the amount of their bids. One of the prominent engineers, however, told me that these works pay in a double way, viz, in the salable material extracted and in the sifting out of the ashes, which impede cremation. The city requires two such concerns, which would cost about $80,000 each. They would be so constructed that the wagon boxes would be lifted to the highest story. The material drops between revolving magnets (to attract all iron articles) through several gratings and sieve-bottom hoppers, the gratings and sieves forming inclined planes, whence the siftings are carried, each in its separate story, to a place where some separation by hand may take place. The magnets are occasionally scraped by a mechanical contrivance. The ashes drop into the lowest story and are conveyed by machinery to barges. After all merchantable material is separated, the rest can go in the furnace to be cremated. This proposed method, however, seems to meet with hygienic objections.

---

[1] See footnote, p. 47.

It is in place here to remark that the little unsalable factory waste is cast into the garbage boxes if solid; if liquid, it flows into the sewers.

SEWERAGE AND IRRIGATION.

The present sewer and irrigation system of Berlin originated nearly twenty-five years ago, and the first year in which house drains were properly established and connected with it was 1875. By the year 1895 every piece of property in Berlin, whether improved or not, and quite a number of properties of the contiguous suburbs had been connected with it, and since then many more of the suburban properties have followed.

During those years the remarkable influence of this sewer and irrigation system upon the sanitary condition of the city shows itself in the death rate of Berlin. Almost exactly in proportion to the ratio of increase in the connections of building properties with the sewer system has been the decrease in the death rate, more especially in deaths from typhus, which from as high as 14 a year to each 1,000 of population in 1872 has run down to as low as 0.53 in 1894 and 0.69 in 1895. Here is the itemized statement for twenty-six years, exclusive of deadborn. The temporary increase in the death rate in 1875 and 1880 is doubtless due to extensive earthwork in pipelaying in these years.

Year.	Number of properties connected with sewers.	Deaths in 1,000 of population.	Deaths from typhus in 1,000 of population.	Year.	Number of properties connected with sewers.	Deaths in 1,000 of population.	Deaths from typhus in 1,000 of population.
		Per cent.				*Per cent.*	
1870	....	30.9	7.7	1883	11,968	28.9	1.79
1871	....	38.6	9.0	1884	14,100	26.3	1.91
1872	....	31.6	14.0	1885	15,395	24.4	1.63
1673	....	30.0	9.5	1886	17,395	25.6	1.33
1874	....	30.2	7.5	1887	17,955	21.8	1.36
1875	57	32.9	9.7	1888	18,479	20.3	1.28
1876	1,025	29.8	6.3	1889	18,984	23.0	1.90
1877	2,014	29.7	6.0	1890	19.898	21.5	.91
1878	2.413	29.5	3.1	1891	21,352	20.9	1.02
1879	3,602	27.5	2.7	1892	22,012	20.2	.83
1880	7,478	29.7	4.5	1893	22,578	20.99	1.06
1881	9,867	27.2	2.9	1894	23,358	17.50	.53
1882	10.468	25.9	3.0	1895	24,689	18.47	.69

The canalization and irrigation system of Berlin consisted, at the close of the fiscal year 1895–96, of two distinct yet closely connected parts. Eleven radial systems fully canalized and drained the 23.01 square miles of the city proper and a few parts of the contiguous suburbs. The cost of this canalization is very closely represented by the city's indebtedness for that purpose, viz, $13,954,062, being for sewers of all kinds, pumping stations, and the iron-pipe system, through which the sewage reaches its final destination. There are, further, 22,861.37 acres of irrigation lands in the vicinity of Berlin, to which the sewage is sent by force pumps as a beneficent and harmless fertilizer. The cost of these, including all improvements, of which the underdrainage was the most expensive, was at the end of the fiscal year $6,978,553, as represented by the city debt for that purpose. The itemized accounts are contained in the printed report inclosed,[1] and a comparison with the report of the previous year shows that the enlargement and improvements of the total system during the year were more than paid out of the sinking fund, making no increase in the debt.

Each of the eleven radial sewer systems has at its central and lowest point a covered reservoir, into which flows the contents of the main sewer of that system, first passing into a smaller reservoir through a grating, this preventing rags or small sticks, which in a heavy freshet may have passed the gutter catch-basins, from entering the pump reservoir. From this, the powerful pumps of the pumping stations force the now thin liquid through closely connected cast-iron pipes to the irrigation lands, situated from 6 to 16 miles outside the city and at an elevation of 60 to 90 feet above its level. Near the pumping station, these pipes have a diameter from 30 to 40 inches; they decrease in size at every succeeding branch, the smallest having only an 8-inch diameter at the high points of the irrigation lands, where by means of a tightly fitting slide they can be opened, when manure irrigation is needed.

On the most elevated points of the various irrigation fields are vertical pipes connected with the subterranean pipes. These vertical pipes contain an easily moving float surmounted by a rod, to the upper end of which a tablet is attached. The distance of this tablet from the top of the pipe shows the workmen, even on quite distant fields, the pressure on the pipe system, by which they have to be guided as to the number of slides which are to be opened. As a precaution against too strong a pressure, the vertical pipes have a side outlet which acts as a safety valve.

Through the opened pipe slides the sewer liquid flows through ditches, of moderate incline, to the place where it is to exert its manuring influence.

---

[1] See footnote, p. 47.

The lands are partly inclined, partly horizontal plains. The liquid is applied to the latter in horizontal ditches, which are reached by inclined ones, and thus allowed to overflow the entire surface so as to make rich meadows.

Of the inclined fields, many are terraced so as to make separate level areas of about an acre. They are generally planted with cabbages, root crops, etc.; also with fruit trees and medicinal herbs. This land as a rule is arranged in beds about 1 yard wide, with irrigating ditches between them. During the growing time of the plants, these ditches are occasionally irrigated with the liquid to about two-thirds of the height of the beds, the liquid thus entering the beds sidewise and coming in contact only with the roots of the plants. The parts planted with fruit, etc., as well as the cropped fields, are entirely flooded at times.

Almost the total extent of the irrigation lands is underdrained, and the water filters through the soil, enters the drainage ditches and finds its way to the natural water courses. It is clear and tasteless.

About 1,000 workhouse people—i. e., men who can find no work in town—and tramps, are sent to these fields from the city. Under the superintendence of competent foremen they are employed in agricultural labor, thereby relieving the city authorities of an otherwise dead weight. When not at work, the men live in good barracks on these lands.

About 3,700 of the nearly 23,000 acres of this land are rented to people who farm it. The remainder is cultivated for account of the city, and supervisors of ability occupy good farm buildings in different places.

On some of the farms are homes for convalescents from the city hospitals.

There are also ponds fed by the water from the underdrains, in which fish of various kinds, even brook trout, thrive and become a source of revenue.

The latest estimates show that by this system, the sewage and street washings of 2,312,968 people have converted 22,861.37 acres of formerly very poor lands into rich fields and garden land, the tilling of which becomes annually more lucrative. At the same time, it has made Berlin one of the cleanest and healthiest among large cities of the globe.

The ingeniously constructed model for this work, in the Hygiene Museum, Kloster Strasse, 32, was made by Mr. Wilhelm Wöffler, who now is custodian of this museum. He is prepared to furnish models of the radial sewerage and irrigation system, with pumping works, either in part or complete.

STREET CLEANING.

The street cleaning of Berlin, so far as the dirt removal is concerned, is done under contract, the city government enforcing its proper fulfillment. The work of sweeping, however, and taking the silt deposits from the gutter-catch basins preparatory to removal is done directly for the city's account. The annual cost varies widely, according to the winter's snowfall, as all snow is promptly removed. The average net annual cost during the last ten years has been, in round numbers, $475,000, after the deduction of about $35,000, realized chiefly by the annual sale of manure. Much of the work is done by machinery, as described in my report on Berlin of November 20, 1897.[1]

MARKET AND ABATTOIR REFUSE.

The refuse of the weekly or semiweekly outdoor markets is at once removed as garbage. The abattoir refuse, including that of the great horse-slaughtering establishment, is almost entirely disposed of to grease rendering, glue making, fertilizer manufacturing, and bone-burning and grinding establishments, and thus utilized to the last degree. What little remains goes into the sewer or is carried off directly in garbage wagons.

DEAD ANIMALS.

A dead animal is hardly ever seen in the streets of Berlin, unless it be a horse suddenly killed by accident.

If a horse dies in a stable or in the street or is permanently disabled or too old for work, it is at once taken to the horse slaughterhouse, a private establishment under close police surveillance and medical inspection. Here the animals, live or dead, and under all circumstances after being slaughtered, undergo a very close medical inspection, which determines whether they are fit for human food or must at once go to the grease rendering, glue, and fertilizer works, where steam tanks quickly destroy all unwholesome germs. The slaughtered horses whose meat is considered sound go into the hands of meat sellers, at prices varying from 2 to 7 cents a pound, and are used largely for human food and to some extent for feeding dogs. On an average, 25 horses are slaughtered here daily.

Dog poisoning is strictly forbidden. Any dog owner wishing to dispose of a dog can send the animal to the dog park, a private institution, to which all stray dogs are also taken. If the owner does not wish to expose his former favorite to the chance of vivisection, he can have him killed on the spot for a small compensation. Carcasses are taken to the same establishment as the unwholesome horse carcasses, where all such material is treated somewhat like the tank-stuff residue of the American packing establishments, only on a smaller scale.

JULIUS GOLDSCHMIDT,
Consul-General.

BERLIN, *March 12, 1898.*

---

[1] See Commercial Relations, 1896-97, Vol. II, p. 356.

CREFELD.

The garbage material of Crefeld, a city of 108,000 inhabitants, contains, in addition to the waste of animal and vegetable foods, a large percentage of tin cans, bottles, broken glass and crockery, ashes, sawdust, floor sweepings, grease, paper, and other coarse rubbish. It is collected by a contractor from the residences at an annual cost of 6 marks ($1.42) per residence. The garbage thus collected is sorted and that portion available is made into compost and used as a fertilizer. In this city, the garbage has always been collected and disposed of in the manner above stated, by contract. There are persons who make a business of collecting bones and rags for different commercial purposes.

The waste water from the kitchen, laundry, and chambers runs into the sewers. From houses which have no sewage connection, these waters run into the gutters along the streets and through traps into the sewers. Of the 8,000 houses in Crefeld, there were in March, 1897, 3,400 with sewerage connection. For the removal of excrementitious matter, the water system is not used. This is collected and disposed of by a contractor, who uses a steam engine for its collection. It is pumped into large tanks on wheels, and afterwards used for fertilizing purposes. These engines and tanks are manufactured in this district. They are usually of 4-horsepower, solidly built, with a perpendicular cross-tubed boiler and jointed smokestack. They are built of material of standard weight and thickness, rest upon a solid 4-wheeled frame, and weigh 2,700 kilograms (5,952 pounds). The above-described engine will fill a tank of 1,500 liters capacity in one or two minutes. The price of the engine is 3,600 marks, or $856.80. Smaller engines of 2½ and 3 horsepower, made as above described, weighing 1,800 kilograms, cost 3,300 marks, or $785.40. The tanks into which this matter is pumped are of two sizes, with a respective capacity of 1,200 and 1,500 liters. Complete with spreader, large steel valves, air valves, etc., they cost 250 and 270 marks, or $59.50 and $64.26. The engine and tanks are so constructed as to prevent the escape of nearly all scent. I attach a cut of the engine and tank used in this city for the collection and removal of excrementitious matter.[1]

The sewers from this city empty into the Rhine, and the sewage receives no treatment whatever. Property owners are required to keep the street in front of their premises clean. The sweepings are collected and removed with the garbage. Solid factory wastes, if any, are of no commercial value; liquid waste is treated in the same manner as other sewage. The official regulations governing the waste from factories are the same as those for other premises. Market refuse is disposed of by contract, and is also used for fertilizing purposes. Dead animals are either buried or burned, according to police regulations. If the animal has not died from a contagious disease, the hide may be saved.

---

[1] Sent to Department of Agriculture.

JULIAN PHELPS, *Consul.*

CREFELD, *May 5, 1898.*

DRESDEN.

GARBAGE.

The population of this city is 378,500.

The material collected contains waste of all kinds and descriptions, such as broken glass, crockery, ashes, tin cans, sawdust, floor sweepings, paper, etc. It is collected in pits located in the rear of each house and is removed by private contractors. The work is not done by the city government, nor does the city designate any special teamster or transportation company for this purpose, but it exercises a strict control as to the prompt removal of the material, and negligence in this respect is severely punished.

Printed regulations issued by the sanitary police department must be posted conspicuously in each tenement house, and strictly observed.

The cost of removal of garbage, etc., averages about 2 marks (47.6 cents) per cubic meter (1.1 cubic yards), or about 10 marks ($2.38) per ordinary cart load, and is paid for by the owner of the premises.

Another system for the collection and removal of the material was introduced in 1893 by a private company, and was approved by the sanitary authorities. Iron receptacles, each holding one-fifth of a cubic meter, are placed by the company in the courtyard of each house and are emptied as often as required. These receptacles are specially built for the purpose, close hermetically, and can be bought or rented. The cost of a complete apparatus is 130 marks ($30.94); extra iron receptacles, 25 marks ($5.95) each. If for rent, the price is 29 marks ($6.90) per annum for one apparatus and two receptacles. The cost for removal is the same as above. Although the time since this system was introduced in Dresden is comparatively short, over 600 of the largest establishments, especially the hotels, have adopted it, either by purchase or by rent, and seem entirely satisfied.

The advantages of this system are: (1) The receptacles can be placed anywhere (courtyard, cellar, or hallway); (2) it prevents soiling courtyards and hallways when removed; (3) prevents growth of vermin, rats, and mice; (4) prevents rotting of garbage; (5) prevents formation of dust; (6) facilitates transportation and removal; (7) permits removal at any hour of the day; (8) makes all reloading of garbage unnecessary; (9) decorates the courtyards; (10) is not dangerous during epidemic diseases, because the material can be removed from the premises within ten minutes. The apparatus is protected by United States patent No. 473561, granted April 26, 1892.

It is not possible to state the exact amount of material collected, but, upon careful inquiry, I learn that it is estimated at 280,000 to 300,000 cubic meters (9,888,648 to 10,594,980 cubic feet) per annum. There is no public dumping ground for this material, but, with the rapid growth of the city, the necessity is keenly felt, and plans are under consideration by the authorities. At present, the material is carted direct to places where filling earth is needed, such as railroad dams, foundations for new buildings, etc. It is thoroughly disinfected and, almost two-thirds of it being ashes, it is not considered nor has it proven dangerous from a sanitary standpoint. Garbage is not used for any other purpose.

TIN CANS, BOTTLES, BROKEN GLASS AND CROCKERY, ASHES, SAWDUST, FLOOR SWEEPINGS, GREASE, PAPER, ETC.

These materials, with the exception of whole bottles and newspaper paper, are thrown into the ash pits, described under "garbage," and carted away without being subjected to special assorting. Wine bottles are either taken back by wine dealers or sold to glass factories and glass dealers at about 5 to 10 pfennigs (1.2 to 2.4 cents) apiece. Large hotels, cafés, restaurants, etc., also sell their broken glass; white at 7 pfennigs (1.6 cents) per pound (500 grams), colored at 5 pfennigs (1.2 cents) per pound (500 grams). Bones sell for 3 pfennigs (00.7 cents) per pound, and are usually collected by peddlers, who go from house to house. Old newspapers sell at 3 pfennigs (00.7 cents) per pound, and are used for wrapping paper.

HOUSEHOLD WASTE WATERS.

In general, the existing city laws do not allow the disposal of these liquids in any other way than by means of direct connections with the public sewers. There are at present 382 houses in Dresden without direct sewer connection, and this is explained by the fact that during 1897 several suburbs, with about 40,000 inhabitants, were taken within the city limits, and it will take some time to extend the sewers throughout these suburbs and complete all the connections. Houses without direct connection with the public sewers are provided with filtering pits ("Sickergruben"), into which the liquids flow. As the soil in and around Dresden is mostly of gravel, this system works very well. Where the gravel does not exist the pits are considerably deeper, and are filled up three-fourths with gravel.

The total number of premises provided with sewer connections in the city of Dresden up to December 31, 1896, was 10,282, of which 9,900, with about 340,000 inhabitants, have direct connection with the public sewer, leaving 382 without direct connection.

In about 1,700 houses, or 15 per cent, the water system is in use, leaving 8,582 without it.

REMOVAL OF EXCREMENTITIOUS MATERIAL FROM HOUSES IN WHICH THERE IS NO WATER SYSTEM.

The work is done by a private company, which is bound under contract with the city to remove and dispose of the material promptly and regularly from all the habitations in the city of Dresden and its suburbs. The city receives no compensation, but exercises a strict control, in order that the work be done in accordance with the established regulations. For this purpose it sends out a number of superintendents, whose duty it is to see that the rules are properly carried out. For this extra labor the company pays the city an annual sum of 8,000 marks ($1,904), which is distributed among the officials. The owners of premises are bound, under penalty, to report promptly to the company when it is time to have their pits emptied. The pits are located behind each habitation, and must be constructed of solid masonry and provided with iron lids that close hermetically. The matter is removed by means of a steam suction pump, which pumps the liquid through iron and rubber pipes into an iron receptacle. This receptacle holds about 2 cubic meters (2.2 cubic yards). Charge for removal is 2.50 to 3.50 marks (59.5 to 83.3 cents) per cubic meter, according to condition and location of pit. The matter so collected is disposed of in different ways. (1) When farms are not at a greater distance than 6 to 8 miles the material is taken direct in the iron receptacles to the fields. Price, 8 to 10 marks ($1.90 to $2.38) per load of one receptacle. (2) To supply farmers who are located at a greater distance, especially those who have their own means of transportation, the matter is dumped into large pits built especially for that purpose and located outside of the city limits. The farmers come in with their teams and purchase such quantities as they may require. In this way, the matter sells at 1 to 1.50 marks (23.8 to 35.7 cents) per cubic meter.

In addition to the large pits just described there are several other pits, holding at least 1,000 cubic meters (35,316 cubic feet) each, located in immediate vicinity of the railroad stations; these pits serve to supply the demand of farms located at a considerable distance. The company owns 47 special cars for transportation by rail, costing from 3,500 to 4,000 marks ($833 to $952) each, including receptacle. The price of transportation is according to distance.

The company operates 11 steam suction pumps, manufactured in Stuttgart and costing $1,000 each, with 67 to 70 meters (73 to 76 yards) of tubing; 90 transportation carts with iron receptacle, at 1,050 marks ($250) each, and 47 special railroad cars as above described.

The pipes have a diameter of 120 millimeters, and are made of iron (galvanized) or of an elastic rubber material. They are so constructed that they can be hermetically locked together. An ordinary pit can be emptied in less than half an hour, and there is very little odor. There are about 12,000 pits in Dresden, representing 120,000 cubic meters of matter when filled. During 1897, the company removed 106,000 cubic meters (3,743,560 cubic feet), for which 325,000 marks ($77,350) was paid. Of this quantity only 48,000 cubic meters (1,695,197 cubic feet), less than one-half, were sold for fertilizing purposes. The sale throughout Germany is very much hampered by the high freight rates, and in addition to this, guano and saltpeter soil from Chile offer strong competition. Steam suction pumps have been in use for seven years; before that, the work was done with hand pumps.

HOUSES IN WHICH THE WATER SYSTEM IS IN USE.

As stated, there are only 1,700 houses with water-closets in Dresden, but the number is rapidly increasing, and no one is allowed to build a new house without using the water system. I dare say the greater number of the old houses in the center of the city, some of which are over 600 years old, would have been supplied long ago with the water system were it not for the heavy expense and lack of space.

In houses with water-closet systems there are usually 2, sometimes 3, pits close to each other. Only the liquid matter is allowed to flow into the public sewer. It is filtered from one pit to the other, and exposed to strong disinfectants which cause it to become quite clear when it reaches the sewer.

The compact matter which settles at the bottom of the first pit is pumped out by the company and disposed of as already described. In order that the liquid matter, before it flows out of the second pit into the sewer, may be examined at any time by the sanitary authorities as to its clearness and condition, a canal or pit (Untersuchungsschacht) must be so located as to render it easy to thoroughly test the liquid. This canal must have a diameter of 60 centimeters (two-thirds of a yard) and must reach 30 centimeters (one-third of a yard) under the pipe connecting the sewer. In this lower part the liquid collects and is taken out for examination whenever it is considered necessary. The pipe connecting the sewer must be provided with a valve, so that the liquid can be shut off at any time.

The water-closets with pits, connecting pipes, etc., must be constructed in accordance with the existing building regulations, and means for ample and thorough rinsing after each use of the closet must be provided.

The water-closets must be at all times open to inspection by the city officials. The compact matter in the first pit must be removed at least once, and, if necessary, twice a year. Negligence in the observance of the laws and regulations is punished by fine up to 150 marks ($36), or imprisonment.

There are 43 public water-closets in the city of Dresden, of which 33 are maintained by the city and 10 by private parties.

Although the manner of storing and removing the excrementitious matter would seem likely to breed disease, the fact is that Dresden is one of the most healthy cities in the world, and the death rate is less than that shown by the statistics of other cities.

WATER-CARRIED SEWAGE AND SEWER SYSTEM.

All the water-carried sewage in the city of Dresden flows direct into the river Elbe. In view, however, of the rapid growth of the city, a plan to collect all the sewage in one large sewer and conduct it below the city into the river is under consideration.

The combined sewer system is in use. Every street in Dresden must be provided with means of sewerage and drainage, and when new streets are constructed, before houses are built, the same provision must be made. These drainages consist of a main sewer located in the center of the street. Earthen pipes from 15 to 20 centimeters (0.165 to 0.22 yard) in diameter, and located at a depth of about 1 meter (1.1 yards) serve to conduct the water from the street, rain water from the roofs, and household waste waters from the houses into the main sewer. The sewer openings serving to lead off the rain water from the surface of the street are located in the street gutter or form part of the granite curbstone. To prevent mud or other compact materials from obstructing or stopping up the sewer pipes, a mud catcher of brick or iron is sunk below each aperture, measuring 1.10 yards deep by 0.44 yard wide. The mud can be easily removed by opening a lid.

In narrow streets, the width of the main sewer canals does not permit men to pass through for cleaning and repairing purposes. Such sewers are provided with round vertical manholes, located at an average distance of 32.7 yards from each other, which serve for cleaning as well as for draining purposes. These manholes have iron lids, coated with asphalt or covered with oak to prevent noise on asphalted streets.

In former times, the sewers were constructed of sandstone masonry cemented with mortar. Smaller sewers consisted of sandstone blocks hollowed out in the shape of gutters and either covered with stone slabs or arched. See following figures 1 and 2.

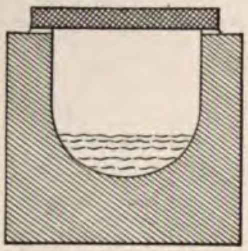


Fig. 1.

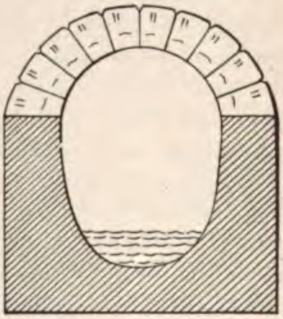


Fig. 2.

At present, sewers are universally constructed of cement mortar and concrete. Sewers of small diameter (varying from 0.49 yard in height and 0.33 yard in width to 1.64 yards in height and 1.1 yards in width) are furnished in ready made pieces 1.1 yards in length.

Larger sewers, of a profile as shown in the annexed diagram, have an extra gutter for waste water (I), and are constructed of stamped concrete. Some parts of the foundation blocks, as *a*, *b*, *c*, are furnished ready shaped for use.

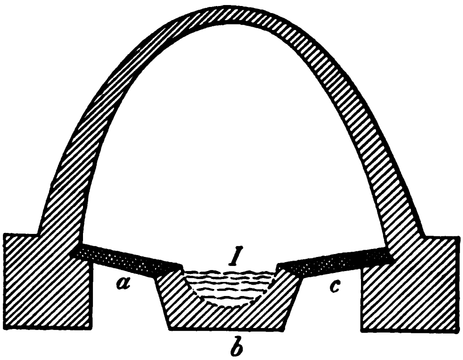


Fig. 3.

The width of the sewers is based upon the following calculation:

FORMULA.

$$W . F \sqrt{\frac{\frac{F}{S} \qquad \frac{h}{l}}{0,00015 \quad + \quad \frac{0,0000045 \; . \; S.}{F}}}$$

EXPLANATION.

W.=Quantity of water in cubic meters required to be drained per second.

F=The cross section of the sewer in square meters.

S=The interior circumference of sewer in meters.

$\frac{h}{l}$=The relative incline of the sewer.

The quantity of water to be drained per second from one hectare of land, equaling 10,936 square yards of area, is calculated as per following table:

[Cubic meters per second.]

	Rain water.	Waste water.	Total.
Densely built	0.05	0.0034	0.0534
Less densely built	.04	.0023	.0423
Single houses (villas)	.03	.0004	.0304

The above figures refer to the minimum profile or section of a sewer. All calculations are strictly based upon these figures, even if circumstances render a smaller sewer practicable.

A rainfall as heavy as 0.7 inches (18 millimeters) per hour is provided for in the above calculation.

COSTS OF SEWERS, ETC.

The average costs of a sewer 1 meter in length at a depth of 2 meters (2.2 yards) is as follows:

Sewer.		Cost for constructing the sewer channel.	Digging and filling up.	Total.	Per each meter (1.1 yards) increased depth of sewer.
Height.	Width.				
Yards.	*Yards.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*
0.491	0.827	7.40 = $1.76	8.41 = $2.00	15.81 = $3.76	2.65 = $0.63
.573	.382	9.23 = 2.20	8.88 = 2.11	18.11 = 4.31	2.83 = .67
.654	.436	11.40 = 2.71	9.30 = 2.21	20.70 = 4.92	3.10 = .74
.817	.545	14.40 = 3.41	10.30 = 2.45	24.70 = 5.86	3.33 = .79
.982	.654	21.15 = 5.03	11.70 = 2.78	32.85 = 7.81	3.61 = .86
1.146	.764	27.65 = 6.58	14.25 = 3.39	41.90 = 9.97	4.47 = 1.06
1.314	.872	33.90 = 8.07	15.40 = 3.67	49.30 = 11.74	4.75 = 1.13
1.635	1.090	43.75 = 10.41	18.25 = 4.34	62.00 = 14.75	5.40 = 1.29

The cost of a manhole connecting a sewer with the street surface when the sewer is located at a depth of 2.5 meters is 105 marks ($24.99), adding 8 marks ($1.90) for extra work and 37 marks ($8.81) for iron lid, giving a total of 150 marks ($35.70) in round numbers. Each meter of increased depth costs 37 marks ($8.81) more. An oak-plated lid costs 53 marks ($12.61). The side sewer pipes when 0.165 to 0.220 yards in diameter cost, ready made, including laying and fastening, from 3.10 marks to 4.02 marks (74 to 96 cents) per yard.

Brick mud catchers provided with iron apertures cost 32.30 marks ($7.69) apiece, including work for laying, etc. Granite apertures with stone lid cost 44 marks ($10.47).

The total length of the sewers in the city of Dresden is calculated for the year ending December 31, 1896, at 196,500 meters, or 216,150 yards.

The cost of maintenance and repair and operation of the sewers amounted in 1896 to 62,000 marks ($14,756). The expenditure for extension of sewer system during the same year was 440,316 marks ($104,795). The above-mentioned sum for maintenance, etc., refers only to the main sewers, while the owners of premises must pay for repairs of all pipes and side sewers connecting their houses with the public sewer.

To the further questions as to whether the sewage is used for irrigation of cultivated land, etc., I answer that there are no irrigated fields in or near Dresden. As already stated, the sewage flows direct into the river Elbe. It is not filtered, or treated with chemicals. The estimated volume of sewage in Dresden is 140 liters (36.97 gallons) per head per day in dry weather, which represents about 800 liters (211 gallons) per second. The number of men employed for the cleaning of sewers is 48. The total expenditure in 1896 for sewer cleaning amounted to 48,000 marks ($11,424). This amount includes implements (about 4,000 marks, or $9.52) and carting (about 8,000 marks—$1,904).

MARKET AND ABATTOIR REFUSE AND DEAD ANIMALS.

These are collected and disposed of by private parties under contract with the city government, by which they are compelled to remove all abattoir refuse and the carcasses of dead animals as promptly as practicable from the city of Dresden and vicinity.

The abattoir refuse consists mainly of the lungs and livers of oxen, cows, calves, pigs, etc. This material is dumped into large copper kettles and boiled until the bones fall out; the fat is skimmed off and collected in casks. This fat sells at 16 marks ($3.81) per centner (112 English pounds), and is bought by soap manufacturers, steel works (for hardening steel), and machine-oil manufacturers.

For a dead horse, if military or belonging to a street railway company, about $1.50 is paid. Cab drivers seldom get anything for a horse, but receive a good supply of wagon grease in return. The hides of horses, cows, dogs, etc., are sold according to market value. To-day, a horsehide would sell at from 12 to 15 marks ($2.85 to $3.57). Cowhides are sold (weighed with horns and tail) at 28 to 30 pfennigs (6 to 7 cents) per pound. Dog skins: Largest size, 1 mark (23.8 cents); medium size, 0.50 mark (11.9 cents); small size, 0.25 mark (5.9 cents). Bones sell at 3 marks (71 cents) per centner (112 English pounds). Dog skulls from 50 pfennigs to 1.50 marks (11.9 to 35.7 cents). Horsehair (tail and mane) 1.50 marks (35.7 cents) each. The boiled meat is sold to farmers for the fields, also as food for dogs, pigs, chickens, etc. Per bucket, 30 pfennigs (7 cents) or 1.20 marks (28 cents) per centner.

The works for the disposal of these materials are located about three-fourths of an hour's travel outside of the city limits, on an elevated point near the banks of the river Elbe. Three large kettles are in continual operation, each holding as much as the carcasses of two good-sized horses. The works are well equipped with the necessary apparatus and utensils, transportation carts, windlasses, and all modern improvements. The works are the property of the city and are leased to private parties for an annual rent of 600 marks ($142.80), this sum being a clear gain to the city.

STREET SWEEPINGS.

General remarks.—The sweeping and cleaning of the streets of the city of Dresden is performed by the city government. The work is conducted and superintended by a special department of the city building board for substructures (in German, Tiefbauamt). The clerical work is done by 1 inspector and 4 clerks. The cleaning and sweeping is conducted by 8 sweeping masters (Kehrmeister), who must wear a special uniform; they also supervise the watering of the streets. There are 3 stations in Dresden where the carts and implements are kept over night and from which the laborers start in the morning.

Extent of cleaning done by the city.—The city undertakes the regular and thorough cleaning of all the paved, macademized, or asphalted streets and public squares located within its limits, with the exception of a few State roads which run through the boundary lines of Dresden and which are cleaned by the State government. The city also undertakes the cleaning of spaces belonging to State buildings, for which the State pays a stipulated compensation.

The street cleaning, as set forth in the law of February 23, 1893, comprises—

For the city, (1) the cleaning of all the driveways and sidewalks, including collection and removal of sweepings; (2) removal of melting snow from the driveways; (3) removal of snow and ice from sidewalks; (4) removal of snow when its volume interferes with the public traffic.

For the owners of premises, (1) the strewing of ashes or sand on sidewalks when rendered slippery by sleet or frozen snow; (2) the removal of snow and ice that falls from the roofs on the sidewalks. Negligence in the observance of these rules is punished by fine.

Area of streets and squares.—The area of the streets and public squares in the city of Dresden was figured, on January 1, 1896, at 1,797,200 square meters (1,976,920 square yards). The area for the year ending December 31, 1896, is not yet obtainable. With a few exceptions this area was cleaned at least once a day. The following table shows the amount of cleaning done with details as to the kind of pavement, as reported by the four cleaning district offices during the period from January 1, 1895, to January 1, 1896:

Cleaning district offices.	Total area cleaned.	Paved, including sidewalks.	Asphalted, including sidewalks.	Cleaned more than once per day.
	Sq. meters.	*Sq. meters.*	*Sq. meters.*	*Sq. meters.*
I	568,730	546,950	21,780	285,420
II	501,410	467,540	33,870	240,000
III	487,860	402,850	85,010	270,950
IV	239,200	239,200	....	141,330
Total	1,797,200	1,656,540	140,660	937,700

Number of laborers, wages and clothing of laborers.—The average number of laborers employed during the same period was stated at 272, of whom 239 worked on paved and 33 on asphalted streets. Therefore, one laborer had to clean about 6,600 square meters per day, or 6,900 square meters of paved and 4,300 square meters of asphalted streets and squares.

The largest number of extra men employed for the removal of snow in one day was 1,172.

The total expenditure for wages during the year was—

	Marks.		
Regular laborers	265,914.04	=	$63,287.54
Extra laborers	85,041.51	=	20,239.88
Total	350,955.55	=	83,527.42

The laborers are divided into three classes. Class I performs the rough preparatory work; Class II does the carting, sprinkling, etc.; Class III does the sweeping. Class I is paid 3.50 marks (83 cents) per day; after five years, 3.75 marks (89 cents) per day; after ten years, 4 marks (95 cents) per day. Class II is paid from 2.80 to 3 marks (67 to 71 cents) per day; after five years it receives an increase of 5 cents to 20 pfennigs per day. Class III is paid by the hour—25 pfennigs (6 cents) the first year; 26 pfennigs (6¼ cents) the second year, and after that 27 pfennigs (6¾ cents) per hour. On Sundays and other church holidays, when street cleaning is done only in the morning, up to church time, the laborers receive full pay, as if they had worked for ten hours, this being the prescribed period of labor. The men are provided with about three suits of clothes per annum, each suit costing 16 marks ($3.81).

The city also pays a hospital tax for these laborers, which insures free care at the city hospital. The tax is about 5 cents per week. The annual expenditure for such tax is from 5,000 to 6,000 marks ($1,190 to $1,428).

The street cleaning.—Paved streets are cleaned during the hours 4 a. m. to 5.30 p. m. from April 1 to September 30, and 5 a. m. to 5 p. m. from October 1 to March 31. On Sundays and holidays, from 3 a. m. to 8.30 a. m. The coarse cleaning of the streets with heavy traffic must be done within the first five hours of the day's work; the streets with less heavy traffic are cleaned during the latter part of the day. The light cleaning is continued throughout the day, especially on the streets with heavy traffic. There are three methods of cleaning: (1) With the street-sweeping machine; (2) by washing (for asphalt); (3) by hand sweeping. The street-sweeping machine is used on streets with flat, even paving stones; coarsely paved streets are swept by hand, and the asphalted streets are washed. This washing is done by flooding the street after it has been carefully swept and freed from all coarse rubbish. The waste water is then pushed by means of rake-shaped rubber scrapers into the sewer openings. Asphalted streets are washed every other day.

Snow and ice is removed, without regard to the hour of day or the traffic, as quickly and promptly as practicable. During heavy snowstorms the sidewalks are continually swept. The driveways are cleared with snowplows, of which twelve are in use in Dresden.

Implements.—The implements for street cleaning in this city are: Twenty-one street-sweeping machines; 6 large watering carts, holding 1.5 cubic meters; 39 hand-watering carts, each with one watering can; 77 handcarts for the collection of sweepings. The brushes of the street-sweeping machines must be renewed about every twenty-five days, so that each machine requires eleven new sets of brushes per annum, counting about 275 workdays. The street-sweeping machines can clean 5,400 square meters (6,458 square yards) per hour. There are further employed 148 rubber scrapers, 42,800 twig brooms, and 1,790 small hand brooms. The estimated value of all these implements is about 57,000 marks ($13,566). Twenty-two thousand cubic meters (776,965 cubic feet) of water are used annually for street-cleaning purposes.

The removal and disposal of street sweepings.—This material is collected in handcarts and taken to a field, from which it is carted away by private contractors. There are two companies bound under contract to the city government to remove and dispose of the sweepings that accumulate every day. They must pay the city 6,820 marks ($1,623) per annum for the sweepings, but receive for their work 38,350 marks ($9,127) per annum as compensation. The sweepings must be carted away within half an hour after they have been collected by the sweepers. The contractors must use closed wagons within the city limits for the transportation of the material, and must load and unload at their own expense. The transportation wagons must be supplied by the contractors. The contractors are under continual supervision by city officials. They are also held responsible for any accident that might occur while carrying the sweepings, such as collision, damage to private property, etc. Snow is removed by private teamsters, and the city pays 1 mark (23.8 cents) for a distance up to one-half kilometer (three-tenths of a mile) per load, and 2.10 marks (49.9 cents) for a distance up to 2,500 meters (1½ miles). The wagons must hold at least 3 cubic meters (106 cubic feet). The snow is dumped into the river.

Costs of street cleaning.—The total revenue from all sources in connection with street sweeping, such as sale of sweepings, contribution from the State government, street-car companies, etc., amounted for the year 1896 to 129,672.29 marks ($30,862). The chief item of revenue was the amount paid by the street-car companies, viz, 119,500 marks ($28,441). The total expenditure for the same period amounted to 599,753.33 marks ($142,741), of which wages to laborers represented the principal item, viz, 350,955.55 marks ($83,529). The above amount of 599,753.33 marks ($142,741) includes 189,501.72 marks ($45,021) extra expenses for removal of snow, and 15,470.53 marks ($3,682) petty expenses. The keeping and repair of street-cleaning implements costs about 15,500 marks ($3,689) per annum; renewal and purchase of new implements, about 22,000 marks ($5,236). Without regard to the revenue, the cost of cleaning one square meter, including removal of snow for same period, amounted to 34.39 pfennigs, or about 9 cents. Excluding snow, the cost of cleaning per square meter is about 22.50 pfennigs, or 5½ cents. The appropriation for the year ending December 31, 1896, was figured at 675,920 marks ($160,869). The total expenditure for 1896, of which an itemized statement is not yet obtainable, amounted to 695,523 marks ($165,534), being 20,000 marks ($4,760) more than the appropriation. The appropriation for 1897 was 789,560 marks ($187,915), and for 1898 is 883,575 marks ($210,291). The considerable increase of the appropriation for 1897–98 is explained by the fact that several suburbs have been taken into the city limits.

While I realize the fact that this report is rather voluminous, it did not seem possible to answer the wide range of questions contained in the circular of the Department in less space.

CHAS. L. COLE, *Consul-General.*

DRESDEN, *March 12, 1898.*

FRANKFORT ON THE MAIN.

SEWER SYSTEM.

The sewer system and water supply of Frankfort are regarded as among the best in Germany. The system includes two networks of very perfectly constructed sewers, each complete and independent. The altitude of the site renders it possible for the sewers to carry off, without pumping or any form of artificial lifting, all liquid sewage, which is poured through grated screens into a series of long, covered tanks, where the solid matter in the sewage is precipitated by the usual process with sulphate of alumina and lime. For several years after the precipitating plant was completed, the precipitated matter was given away to the farmers of the neighborhood, but when its value became appreciated and the demand exceeded the supply, a charge of 4 cents per ton was made for the sludge, and at this price there was derived, during the fiscal year 1896–97, for sludge and the solid matter gathered by the screens before reaching the precipitation tanks, a revenue of 3,089 marks, equal to $735.

The entire sewer system of Frankfort, its plan, cost of construction and maintenance, the method of precipitation, revenue, and the general results as affecting the death rate, etc., were fully described in a special report from this office dated October 27, 1894, published in Consular Reports No. 173, for February, 1895, pp. 203–208, to which and to the printed volume with maps, therewith transmitted, the Department is respectfully referred.

COLLECTION AND DISPOSAL OF GARBAGE.

The population of Frankfort, according to the latest estimate, is 245,000. Garbage is collected throughout the city by a contractor named Schultheis, whose large covered wagons make the entire circuit of the streets twice each week during the early hours of the forenoon, and collect garbage and house sweepings from special receptacles set before the door during the previous night or before 6 o'clock in the morning. These receptacles are required by ordinance to be covered and fireproof, and they are usually in the form of large tanks or pails of zinc or galvanized iron, with hinged lid and handles for one or two persons. Into these are put the garbage of the house, including ashes, waste of animal and vegetable food, more or less dirty waste paper, empty cans, bottles, broken crockery, and other rubbish. The gathering wagons have high boxes covered with hinged lids so as to prevent the blowing of dust and ashes in windy weather, and when laden they convey the ashes and garbage to a prescribed dumping ground beyond city limits, where it is thrown out and picked over for whatever available material may be contained. The residue, mainly ashes, old tin cans, bottles, and broken crockery, makes an unsightly heap, which, when possible, is put into an excavated gravel pit, covered with a layer of soil, and the space thus restored to cultivation. For this entire service, the municipality paid during the fiscal year 1896–97, 99,670 marks, equal to $23,721.46.

STREET SWEEPINGS.

The streets of Frankfort are swept and cleaned by the municipality, for which purpose a special corps of 103 men, with brooms and horsepower sweeping machines, besides 16 cartmen with 18 horses for hauling away the sweepings, are permanently employed. This department includes also the street-sprinkling service, and costs altogether 311,868 marks, or $74,324, per annum. The accounts of this department show that Schultheis, the garbage contractor alluded to above, paid last year $1,092 for the materials of value culled from the street sweepings gathered by the city. For the entire fertilizing matter obtained from house and market garbage and street sweepings, which is sold to neighboring farmers, the city receives a net revenue of $6,000 to $7,000 a year. There are no factories or chemical works in Frankfort that yield refuse which would give to its sweepings or sewage any unusual character, and they are therefore those of a cleanly well-kept municipality, with an abundant and excellent water supply, a high average standard of living, and all modern sanitary improvements.

FRANK H. MASON, *Consul-General.*

FRANKFORT, *April 15, 1898.*

FÜRTH.

Fürth, Bavaria, has a population of about 50,000; being a small place, there is no board of health, nor are there printed reports of sanitary matters.

The streets are swept and kept clean by the property holders. They must be swept Saturdays and Wednesdays, and the refuse is carted away by private parties at the expense of the tenants of the buildings, each paying 7 cents per month. The same parties carry away the ashes and other rubbish from the buildings. The garbage is used for fertilizing. Tin, ashes, broken glass, sweepings, kitchen, and other rubbish are put into buckets and hauled away twice a week by the men who remove the street sweepings.

The household waste waters are carried by stone pipes into a dry well. This well is pumped out whenever it is necessary by a portable steam pump, through a 4 inch rubber hose, entirely air tight and odorless, into an iron tank. The tanks are emptied upon the lands in the suburbs. The work is done by a private party, who receives 1.5 marks (36 cents) per load.

Fürth being a small place, the sewerage system is limited, and only the rain water from roofs and streets is permitted to enter the same. It empties into the Pegnitz River.

Dead animals are carried away by a private party, the owner paying from 50 pfennigs (12 cents) and upward. This person takes the animal to the commons and removes the hide, hoofs, and any other part that he can make use of. The remainder is buried.

I am exceedingly sorry that I am unable to furnish a more complete report than this, but it is impossible for me to secure the information that is desired by the Department.

C. W. ERDMAN, *Consul.*

FÜRTH, *February 28, 1898.*

HANOVER.

Hanover and its immediate suburb, Linden, embrace a population of about 270,000. They have an abundant supply of wholesome water, derived from wells in gravel beds in the vicinity of Linden.

SEWERAGE.

There is a general system of sewers which discharge their contents about a mile or a little more below the city into the River Leine, a small but very rapid stream. The natural grade is sufficient to make the drainage good, and notwithstanding the great amount of sewage poured into the small river, it clears itself within a distance of 5 or 6 miles, and the water is practically as pure as above the city. Nine-tenths of the buildings and dwellings of Hanover are connected by pipes with the system of sewers, and all excrementitious matter and waste waters are carried off into the river, no attempt being made to utilize any portion thereof for fertilizing purposes. Some of the older buildings and some dwellings on new streets near the outskirts are still unconnected with the sewers, but their number is rapidly decreasing, and it is estimated that within a year, or two at the outside, every house in the city will be properly sewered. Excrement and waste water from such houses are conducted through pipes into cesspools in the basements, and from there, when necessity requires it, are pumped into wagons constructed for that purpose and transported to the country, to be used as fertilizing material. This method of disposing of excrement is regarded as a nuisance in every neighborhood, and landlords, in order to hold their tenants and obtain good rentals, are compelled to put in sewer connections.

GARBAGE.

Garbage, consisting of the waste of animal and vegetable food of all kinds, tin cans, bottles, broken crockery and glass, worn-out and broken cooking utensils, ashes, paper, rubbish, sawdust, floor sweepings, old shoes, hats and clothing, cloth and leather scraps, and, in fact, every article a householder may wish to get rid of, is disposed of as follows: Every street in the city is visited three mornings a week, between the hours of 7 and 10 o'clock, by the garbage wagons, which carry off all such materials free of charge to the householder, provided they are placed in convenient situations on the sidewalks in front of the houses, in vessels, coal scuttles, or pails of a size suitable for the teamsters to handle. The expense is borne by the municipality, which has the work done by contract. The cost of removing the garbage last year (1897) was 63,516 marks, or $15,123. The materials removed belong to the contractor. They are transported outside the city limits, generally to some low and marshy piece of ground, and there dumped and sorted carefully. The broken glass, crockery, and like materials are used for making foundations for country roads and paths. All other articles worth saving are sold to the poor or to junk dealers. Such of the garbage as can be used for feeding hogs or cattle is sorted out and sold to farmers, and the balance, after it rots, is disposed of to gardeners and farmers for fertilizers. There is no cremation of garbage here. The materials are regarded as too valuable to destroy.

The wastes from markets and abattoirs are also utilized by farmers as manure. All dead animals are removed from the city by the public scavenger. The skins are sold to tanners and the carcasses go to the soap factories.

STREET CLEANING.

The cleaning, sweeping, and sprinkling of the streets of Hanover are done by the municipality itself, in a very thorough manner. The city owns teams and wagons for that purpose, and employs the poor and those who are in a measure dependent on it for a living to do the labor. Sweeping is done by brooms, not by machines. In 1897, the amounts expended by Hanover for these purposes were as follows:

	Marks.	
Street cleaning	123,624 =	$29,434
Cleaning snow and ice	85,866 =	20,444
Maintenance plant, etc	19,077 =	4,542
Street sprinkling	11,865 =	2,823
Total	240,432 =	57,243

The street sweepings are used by the city, as far as possible, for fertilizing the public parks and gardens. What can not be used in this way is sold to farmers and gardeners.

W. K. ANDERSON, *Consul.*

HANOVER, *March 11, 1898.*

MAINZ.

In this city of 75,000 inhabitants, as well as in this entire district, garbage and other refuse is disposed of in the old-fashioned way, by dumping it on lowlands in order to fill them.

This city has no sewerage system, each house having its cesspool, which is emptied periodically. Along the streets catch basins are located, into which the water-carried sewage of the streets drains, and which are also emptied periodically by means of buckets. The matter thus collected is also dumped on the lowlands.

Excrementitious matter is collected by the city excavator, and is sold to farmers, who use it as a fertilizer.

All dead animals are carted away and disposed of by a contractor.

The "Reinigungs amt" (cleaning department), which controls the disposal of all garbage, sewage, etc., expends about $6,000 annually for street sweeping, $4,000 for watering the streets, $4,000 for removing snow, and $22,000 for collecting and disposing of sewage, garbage, excrementitious matter, etc. From this latter sum, however, must be deducted $16,000, which is about the amount the department realizes on the sale of excrementitious matter.

WALTER SCHUMANN, *Consul.*

MAINZ, *March 9, 1898.*

MUNICH.

Referring to the circular of the Department of State dated January 20, 1898, I have to say that the disposal of garbage, sewage, etc., is not a matter treated by modern scientific methods in my district, and is not of special interest for other reasons.

BENJ. NUSBAUM, *Consul.*

MUNICH, *March 18, 1898.*

NUREMBERG.

Nuremberg, the second largest city in the Kingdom of Bavaria, has a population of about 200,000 inhabitants.

GARBAGE.

The removal of garbage is intrusted by the city to a contractor; the administration and all the clerical work pertaining to this department is, however, done by the city government. The garbage collected contains not only animal and vegetable matter, but also all the waste material which accumulates in the household, such as broken china, glass, ashes, paper, etc. An exception is made only with regard to factories. These have to dispose of waste themselves; it may be brought by them to a place reserved by the city authorities for rubbish. Twice a week the garbage is collected by the contractor. A normal household has to pay 2 marks (48 cents) per year for collection; hotels pay according to their size, from $4 to $10 or upward.

The contractor receives 90 per cent of the total amount collected. For the year 1898, the estimate of the value was 66,000 marks ($15,708). He has to carry away the garbage from the houses to a site about 1 mile outside the city. This site has a very sandy soil, and for this reason was selected by the city authorities. The sand is fine, of gold color, and excellently adapted for building purposes. It is dug out to a depth of about 7 to 8 meters (7½ to 8¾ yards), and sold at the rate of 30 pfennigs (7½ cents) per carload. The city is subjected to no expense for its removal, as buyers have to send their own carts to carry it off. The sum realized by the city for sand in the year 1896 amounted to 8,508 marks ($2,024.90). The holes are filled up with garbage. A certain system has been brought into use in performing this work. The garbage which is collected in winter, and which consists chiefly of coal cinders, is used first of all in filling up these holes to a height of about 5 to 6 meters (5½ to 6½ yards). The 2 yards of filling which are yet needed to reach the ground level are put in in summer. The garbage which is deposited in summer is intermixed with layers of sand, mud, and refuse. This latter mixture is an excellent fertilizer. It brings forth weeds in a very short time. To prevent this, the land thus prepared is rented gratis, for a period of about two years, to poor people to grow potatoes.

After this period, the soil is planted with either maple, birch, or ash trees. It is the intention of the city authorities to grow a fine park on this site. It has an area of about 100 acres. Some 2½ acres are covered annually with garbage.

The estimate of the city for the year 1898 is as follows: Income derived from collection of garbage, 66,000 marks ($15,708); filling up with garbage, putting up fence around the holes, repairing street leading to site, 7,730 marks ($1,840); administration, clerical work, etc., 4,130 marks ($983); total, 70,870 marks ($16,867). The city would therefore have a deficiency of 4,870 marks ($1,159), but it must be mentioned here that the contractor has to remove the garbage from all the city buildings, for which service he does not receive payment; besides, the income derived from the sale of sand is not accounted for in this statement.

This system of disposing of all the household garbage has been in use for ten years in this city, and as it aids in the formation of a city park, without involving any expense, it may undoubtedly be called a good one. It must, however, be borne in mind that only cities with sandy soil around them, like Nuremberg, can profitably adopt this system.

In former years, garbage was either removed by the contractor to a dumping place or used by the city for the amelioration of the soil. The contractor was allowed to sort the garbage; useful waste, like paper, metal, etc., he was permitted to sell. It has been found, however, that there was always great danger of infection in this system.

Refuse matters, such as tin cans, bottles, broken glass and crockery, ashes, sawdust, floor sweepings, grease, paper, and other coarse rubbish, are not sorted out.

SEWERAGE.

Household waste waters, with but rare exceptions, go into the public sewers, as nearly all houses are connected with the public system.

Excrementitious matter not water-carried is collected in water-tight cesspools which are emptied pneumatically. The matter is removed from the houses in boiler-shaped tanks holding about 333 gallons. The charge for collection and removal per tank is 3 marks (71½ cents). It is then either brought to a large reservoir, where it can be purchased by the neighboring peasants for manure, or sent by rail to other places in the country.

The estimate of the city for the year 1898 is as follows:

	Marks.	
INCOME.		
Collection of excrementitious matter	74,500.00 =	$17,731
Sale of the same	23,500.00 =	5,593
	98,000.00 =	23,324
EXPENSES.		
Keeping stock, like horses, carts, etc., in good condition, administration	97,646.59 =	23,240
Profit	353.41 =	84

There are many water-closets now in use here, but the water system does not carry away all the excrementitious matter; the more solid parts drop into the cesspools.

Water-carried sewage.—The system employed in this city is the combined sewer system, nearly all the houses having sewage connections. The sewage is delivered into the river outside the city district, not by pumps, but by its own fall, and no further use is made of it, with exception of the mud, which is taken from the sewers. This is either used as a fertilizer or employed for the amelioration of the sandy soil around Nuremberg.

STREET SWEEPINGS.

The sweeping in about two-thirds of the total area of the city district is done by the local authorities; in the remainder, by the inhabitants themselves. It has been left until now for the citizens to decide whether they want to do the sweeping themselves or whether they let the city government do it for a certain charge, but the local authorities contemplate making it compulsory for the citizens to have it all done by the city government, at a reasonable rate. The sweeping is done with brooms and the dirt is removed in large, closed tank carts. It is either used by the city gardener to improve the parks or is employed to fill up the place reserved for garbage. The expenses incurred by the city for cleaning paved streets (collection, removal, wages, administration, etc.), in the year 1897, were 4.17 cents per square meter (1.3 square yards) during the summer months; 2.62 cents per square meter during the winter months. The latter amount is the average for the last six years, and it includes removal of snow and ice. The scattering of sand to prevent slipping has to be done by the house owners. Those roads which have much traffic are paved with granite; those with but small traffic with quartzite.

The last report issued by the city shows that in the year 1896, the total area of paved roads amounted to 465,137 square meters (556,304 square yards); 265,568 square meters (317,619 square yards) of these were paved with granite, 184,002 square meters (220,066 square yards) were paved with quartzite, and 14,567 square meters (17,422 square yards) were paved with diorite. The footpaths on either side of the paved roads, 100,000 square meters (131,560 square yards) in extent, are paved with square burnt clay plates.

The macadamized roads have an area of about 600,000 square meters (717,600 square yards), and there are about 500,000 square meters (598,000 square yards) of footpaths. The greater part of the latter are likewise covered with square burnt-clay plates.

MARKET AND ABATTOIR REFUSE.

The market refuse is removed and disposed of in the same way as street sweepings and garbage. The abattoir refuse is destroyed by fire in a furnace, as well as all those parts of meat and even whole slaughtered animals which are found to be unfit for consumption. The report of the city slaughter house for the year 1896 states that 13 pieces of cattle, 34 calves, 7 sheep, 111 pigs, 8 horses, and 2,854 sets of bowels were destroyed. Until now, no practical use has been made of the products derived from the refuse burned in this furnace, but the city authorities contemplate the erection of a thermic destruction establishment with all the modern improvements, by which tallow for soap making and fertilizers are gained. I hear that a sum of $38,080 has already been provided for this purpose, and has been included in the estimates of a new city loan, but no suitable territory has been found, nor has the city government decided regarding the system to be employed. My attention has been called on this occasion to the systems of Podewil's Faecal Extract Company, Munich, Bavaria, and the Actiengesellschaft für Trebertrocknung, Cassel, Germany. They both manufacture apparatus for treating and utilizing the carcasses of animals and the refuse of public slaughter houses.

DEAD ANIMALS.

Dead animals have, until now, been buried in pits 2½ yards deep, outside the city district. The carcasses are first covered with quicklime and then with sand. Dogs are almost the only animals disposed of in this way, and the expenses for the city are, therefore, but small. Dogs which are found straying within the city district are advertised, and if not claimed within three days are killed and interred. In the year 1897 about 70 dogs were killed, the expenses incurred by the city for their collection, feeding, and killing amounting to about $54.

As soon as the aforementioned thermic destruction establishment has been erected here, this old system of burying carcasses will be abandoned, and stray dogs and other animals intended for destruction will be brought to this establishment.

GUSTAVE C. E. WEBER, *Consul.*

NUREMBERG, *April 28, 1898.*

STUTTGART.

Stuttgart is the capital of Wurtemberg, with 162,934 inhabitants.

GARBAGE.

In addition to the waste of foods, the garbage of the city contains household sweepings, rubbish, ashes, rags, broken glass, bottles and kitchen utensils, paper, old shoes, tin cans, etc., which are daily collected by wagons passing through the streets in the forenoon, housekeepers being obliged to place the refuse in boxes or barrels before the doors early in the morning. This is carted away and dumped in the suburbs in natural ditches, of which there are plenty, the city government having first purchased the land. There are always a number of ragpickers on these dumping grounds, who have permission to gather from the rubbish all rags, paper, tin cans, old iron, bones, etc. The dumpings are then spread out and layers of sewer mud, gathered by mudcatchers in the street gutters, spread over it. When these ditches are properly filled up they are rented to vegetable gardeners. This work and the street cleaning are done by the city and conducted by a separate department, the "Strassen Reinigungs Amt" (street cleaning department).

For cost of street cleaning and garbage gathering see report of the city government, pages 34, etc., herewith inclosed.[1]

The city has secured a plot of ground in a suburb on which a crematory will be erected, and in future all garbage and street sweepings will be cremated, as is done in Hamburg. The ashes therefrom will be unfit for agricultural purposes, and will, in combination with lime, be manufactured into bricks for inside walls of houses.

Tin cans, bottles, broken glass and crockery, paper, etc., are not treated separately by the street cleaning department, but, as reported above, are gathered with the garbage and street sweepings and deposited on the dumping grounds.

SEWERAGE.

Household waste waters from the kitchen, laundry, and chambers (with the exception of the contents of urinals, which must be emptied into the closets) are carried away by pipes connected with the street sewer. Each house must be connected with the street sewer at the expense of the owner, and these private sewers are cleaned by the city, also at the expense of the owner.

Water-carried sewage in Stuttgart is conducted into the river by a complete sewage system.

Excrementitious matter is not carried away by sewerage, but every house has a sink, well cemented and covered, in which it is gathered, even in the case of houses which have water-closets connected with the street water pipes, and most of the newly built houses have such closets. Stuttgart has the following system of disposing of the excrementitious matter: By a large number of steam and hand pumps on wheels, the sinks are from time to time pumped out, and the matter, through wide, spring expanded, india-rubber hose, carried into the airtight vats on wagons, which empty their contents into large cemented reservoirs erected in different places outside the city limits. Here, farmers buy the matter and cart it away to their lands. The city has such reservoirs also in various neighboring counties, near railroad stations, whither it is transported on cars carrying 3 large barrel-shaped tanks each.

---

[1] Sent to the Department of Agriculture.

House owners have to pay a certain fee per hectoliter for the emptying of their sinks, and this revenue, together with the receipts for the excrementitious matter sold to farmers, pays the city a profit of 4 per cent on the invested capital. The fee for emptying the sinks is regulated from time to time.

The city's excrementitious matter is not carried away by a pumping system and used in manuring land, as is done, for instance, in Berlin, the soil around Stuttgart being rich enough. No excrementitious matter is allowed to be carried into the sewerage system.

STREET SWEEPINGS.

These are collected, removed, and disposed of in the same manner as garbage, and by the same department.

In the inner and old part of the city, and on the principal thoroughfares, the pavement consists of square and oblong hard stones and granite blocks. As an experiment, a few streets have lately been paved with wood.

New streets are macadamized, and have paved side gutters. The dirt from them is removed and disposed of as described under garbage.

Factory wastes, solid and liquid, are not known in this city, factories producing such not being allowed within the limits.

MARKET AND ABATTOIR REFUSE.

Market refuse is treated and disposed of in the same way as street sweepings and garbage. Abattoir refuse is gathered in large cemented reservoirs in the yard of the abattoir, and sold to gardeners and farmers, who cart it away themselves. The Stuttgart abattoir, owned by an association and stock company of butchers, now within the city limits, is about to be removed to a neighboring county.

DEAD ANIMALS.

Dead animals, such as horses, cattle, etc., are in charge of a city official called the "abdecker," who has to be notified at once (by telephone) when an animal falls dead. He removes the carcass (generally in the night if possible) to a plant owned by the city outside the municipal limits, where it is reduced to fat and glue. The hides and the shoes of horses belong to the owner of the dead animals. Besides the perquisites of this business, the "abdecker" draws a salary from the city and Kingdom, he being at the same time high sheriff for the Kingdom, and having to execute the death penalty on criminals.

EDWARD H. OZMUN, *Consul.*

STUTTGART, *March 28, 1898.*

WEIMAR.

Weimar, capital of the Grand-Duchy of Saxe-Weimar, Eisenach, has a population of 26,000.

GARBAGE.

The material collected consists of ashes, bottles, tin cans, etc., in addition to the waste of animal and vegetable foods. The amount collected annually is 7,000 to 8,000 cubic meters (247,216 cubic feet to 282,533 cubic feet). The system employed consists of collecting the garbage in vessels, usually zinc barrels of uniform size; that is, about 2 feet high and 1½ feet in diameter. These are placed by the tenants before their houses, and collected in covered wagons usually four times each week. The cost of collecting garbage is about 6,000 marks ($1,428) per annum. The work is done by the city government. The material is used to fill old stone quarries in the neighborhood. The sum above mentioned covers all expenses.

STREET SWEEPINGS.

Street sweepings are removed by box cars from the city to an establishment where they are mixed with natural manure and eventually sold. Street cleaning costs about 10,000 marks ($2,380) per annum, to which must be added 1,000 marks ($238) for brooms, watering pots, etc., and 1,000 marks for horse hire and water for street sprinkling.

DEAD ANIMALS AND ABATTOIR REFUSE.

Dead animals are sent to a flayer, whose establishment is under police supervision. The city incurs no loss in this connection, simply putting a suitable shed and place of interment at the flayer's disposal.

Abattoir refuse is collected in reservoirs and sold as fertilizer.

THOS. EWING MOORE,
Commercial Agent.

WEIMAR, *March 6, 1898.*

GIBRALTAR.

The Rock of Gibraltar is divided into two districts—northern, on which is the city proper, and southern, with a small fishing village on the seashore on the northeastern side of the Rock.

According to the last census, taken in 1891, the population of Gibraltar consisted of 25,755 souls, of whom 19,100 are civilians, and the remainder formed the garrison.

GARBAGE.

In addition to vegetable and animal matter, the material collected contains every conceivable article cast away in households or barracks. The amount of material collected daily is about 20 tons. Collection is made by means of dust carts, the drivers of which visit every house twice a day during summer and once in winter, carrying away all material which had been previously placed by the inmates in dust bins. Excrement of fowls, fish, cats, dogs, and birds finds its way into the dust bins, but the dung of horses, mules, donkeys, and goats is carried off on the backs of donkeys and mules to Spain, over the frontier, there to be used as manure for vegetable gardens, save a very small portion, which remains in Gibraltar, and is used for improving the soil of the public flower gardens on the Rock.

The cost of the collection and removal of the material from the city amounts to about $5,000 per annum. This work is done by a corporate body created by the colonial government, under an order in council, which here is equivalent to an act of Parliament in England. It is styled the "sanitary commission of Gibraltar."

All material collected by the dust carts of the sanitary commissioners is brought to the place where the destructor is located, and is then taken over by men engaged by the party who has the contract with the commissioners, for removing all bones, bottles, broken glass, tin cans, paper, baskets, pieces of metal, broken crockery, etc., found in the material. It is then sorted out and the garbage and other refuse are placed in the destructor by the contractor's men, who, after cremation, throw the ashes into the sea. The contractor, besides having the right to sort the material, receives $2 per diem for his trouble.

It costs the sanitary commissioners about $600 annually to keep the apparatus in order.

No notice is taken of the chemical properties of the material sorted or cremated, there being no available space in British territory for carrying out work of this nature. The materials extracted are generally taken over the frontier to Spain.

Cremation commenced nine years ago. The other methods have been followed for about twenty years.

Before the cremation system was adopted, all rubbish collected was taken to and placed on the northeastern extremity of the Rock, on the eastern beach of the isthmus which unites Gibraltar to Spain. There, it was handed to the contractor already mentioned, and instead of being cremated was thrown into the sea.

The material is not used as a fertilizer, nor for the manufacture of grease. All grease, vegetable, and food refuse in the kitchens of barracks is collected by parties who have special contracts with the commanding officers of the military corps. They pay an annual sum for this privilege, as stipulated in the contract. The parties engaged in this work are generally Maltese. That portion that is not in a fit state for human consumption is carried over the frontier for fattening pigs in Spain.

SEWAGE.

Household waters from kitchens, laundry, and chambers are disposed of through pipes, with which all houses are furnished, and which are in connection with the street sewers, all of which are connected with the main sewer. This empties into the sea at a place to the east of Europa Point, and the contents are carried by the current into the Straits of Gibraltar. In all houses and dwellings in Gibraltar, excrementitious matter is removed from the privies by flushing, the privies being also connected with the street sewers.

The fishing village at Catalan Bay, with a population of about 250 souls, has no drainage. Sewage is removed from the privies by soil carts at night. The carts and privies, both before and after being emptied, are disinfected with chloride of lime, and in many instances, with perchloride of mercury.

The block of buildings on the elevated plateau at Windmill Hill at the southeast end of the Rock, used as barracks and a military prison, as well as the huts which form the military camp on the western side of the isthmus, are treated nightly in the same manner as the village at Catalan Bay.

The materials collected at Catalan Bay, Windmill Hill, and Military Camp are cast into the sea, without cremation, at the same place where the ashes from the dust destructor are thrown.

STREET CLEANING.

Street sweepings are collected and placed in the dust carts of the sanitary commission by sweepers employed for that purpose, and are conveyed to the dust destructor for disposal in the same way as other material collected from dwellings. The cost of this work amounts to about $4,500.

The only factories in Gibraltar are for the manufacture of mineral waters and for converting leaf tobacco into chopped tobacco for cigarettes. In the first instance, the waste consists of water and residues of chemicals, all finding their way into the house drains, and thence by the sewers to the sea. In the second instance, all the tobacco waste is carried out at the expense of the owner, taken to the dust destructor and there cremated.

MARKET AND ABATTOIR REFUSE.

Market refuse is removed in dust carts, properly disinfected with chloride of lime, to the dust destructor, and the useless portion is cremated. Abattoir refuse, in the shape of offal, bones, horns, etc., is taken to Spain by a contractor.

No profit is derived in the method adopted for the disposal of dead animals. They have to be removed and buried on the beach, on the eastern side of the isthmus, at the owner's expense. The spot is under military jurisdiction. They are buried in pits dug for the purpose, 6 feet deep, and the carcasses are laid on a layer of burnt lime and covered with the same material, and afterwards with sand. The cost of this work to the owner is about $5. These carcasses are not utilized in any way for industrial or agricultural purposes.

HORATIO J. SPRAGUE, *Consul.*

GIBRALTAR, *March 8, 1898.*

ITALY.

CATANIA.

The population of the city is officially estimated at 120,000. Street sweeping is done by contract.

GARBAGE.

The contractor obligates himself to keep all the streets clean and to place at the disposition of the city government all the men, implements, carts, and horses necessary to carry on the work. The city government pays all the wages of the laborers employed—i. e., 130 sweepers, at 1.25 paper lire (about 23 cents gold) per day; 4 bosses, at 1.50 lire (about 28 cents gold) per day; 4 overseers, at 2 lire (about 37 cents gold) per day. Twelve of the sweepers have to do night work, for which they receive overtime pay of 0.25 lira (or 4½ cents) per evening. The sweepers carry suspended on leather straps over their shoulders a large basket, into which they put all the rubbish and sweepings. When filled, these baskets are emptied into one of the numerous covered handcarts. All the refuse gathered belongs to the contractor, who employs 14 large horse carts (into which are transferred the contents of the handcarts) for removing it to a place of deposit, designated by the authorities, outside of the city limits. These carts make not less than 5 trips per day, often 6 or 8, according to distance; but calculating only 5 trips each for 14 carts employed would give a total of 70 cart loads of sweepings per day, which in one year of 365 days amounts to 25,550 cart loads of refuse of all kinds. It is used by gardeners or truck farmers of the surrounding country as manure, and is also at times shipped by rail to more distant places. The price at which the contractor sells the sweepings (consisting to a considerable extent of dung of horses, asses, and goats, herds of the latter being driven through the streets twice a day, to be milked at the doors of customers) ranges from 1 lira (18½ cents) per cart load as soon as collected, up to 1.75 lire (32½ cents) aboard car, per cart load of macerated or fermented manure from off the deposit pile outside of city. The price depends to a certain extent upon the distance.

The expenses incurred by the contractor involve the maintenance of 14 horse carts for removal of sweepings and 2 horse carts for removal from the streets of stones used in building, repairing, etc. These carts require 16 horses steadily employed for hauling sweepings, and 4 extra ones for relieving the others, making 20 horses to be kept and fed at 1.50 lira per day, or 30 lire ($5.55). The average daily expense for shoeing is 1 lira ($0.18½); for rent and miscellaneous, 9 lire ($1.66½). Wages of 16 cart drivers, at 1.25 lire per day, amount to 20 lire ($3.70), making the total expenses per day 60 lire ($11.10).

The following shows the result of business per annum: Minimum quantity of sweepings collected, 25,550 cartloads; average value per load, 1.25 lire; amount lire, 31,937.50 ($5,908.44). Expenses in 365 days, at 60 lire per day, 21,900 lire ($4,051.50); net annual profit to contractor, 10,037.50 lire ($1,856.94). To this must be added profit from another source—i. e., during the summer months the city has the principal streets sprinkled, and this is also done by the contractor who attends to the street cleaning. For this work, he uses the same horses and carts and the same drivers employed in the removal of the refuse; hence incurs no additional expenses. The city furnishes the water, and pays to the contractor 0.50 lira (9¼ cents) per cask. This amounted during last season to 3,402.75 lire ($629.51), which, added to the other profit, makes 13,440.25 lire ($2,486.45).

Broken glass—although this method of disposal is prohibited—is thrown recklessly into the streets. Glass, small tin cans, etc., of no use as fertilizer, are picked out by the gardeners or truck farmers—who purchase the sweepings—and thrown into a pit dug for that purpose. Nothing is thrown away that can be put to use.

Rags the contractor has carefully picked out, as the contents of the carts are dumped upon the deposit pile, and sold to the rag exporters.

Carcasses of dead animals are hauled to the beach south of the city, and buried in the sand. Nothing is utilized but the bones, which are from time to time picked up by bone gatherers. There is no factory for utilizing carcasses of dead animals.

SEWAGE, EXCREMENTITIOUS MATTER, ETC.

There is not a regular system of sewers in this city. Under the principal streets are subterranean canals or aqueducts, which serve solely to receive and carry off the rain water and to drain the public urinals, which are on nearly every street corner. It is, however, absolutely prohibited for private persons to make connection with the said aqueducts for the purpose of discharging household waste water. At present there is no system in use for flushing the sewers, except what is done by the winter rains, the water running into the openings left in the pavements for that purpose. Where the streets are inclined toward the center, there are gratings about 12 by 15 inches at intervals in the middle, and where streets are higher in the center, with gutters on the side, apertures of about 2 by 10 inches, without gratings, are made in the curbstones. At the beginning of the summer season, these apertures are closed with stone and mortar and left so until the rainy season sets in, to prevent exhalations harmful to public health. The stench arising from these apertures, as the weather gets hot, from the altogether too numerous public urinals, is sufficient to cause an epidemic. In the future, I am told, some mode of flushing the aqueducts, which open into the shallow end of the port, is contemplated. Household waste water is discharged into the ground, the subsoil being absorbent and porous, and, aided by the natural inclination toward the sea, is easily drained into the latter. Privy vaults are generally, during the night, emptied by laborers especially employed for this service, by means of scoops and buckets. The matter is put into barrels and transported to the beach south of the city, to a place designated by the authorities. There it is converted into fertilizer, under the supervision of the forester, the municipality having been engaged for some years in turning a portion of the sandy waste which stretches along the shore of the Mediterranean into forest, thereby supplying a pleasant suburban drive and promenade. The average cost of having the vaults emptied is from 6 to 7 lire (paper currency) or $1.11 to $1.30 per cubic meter.

LOUIS H. BRÜHL, *Consul.*

CATANIA, *April 29, 1898.*

FLORENCE.

According to the census of 1897, the city of Florence had a population of 194,631 inhabitants. The area within the city gates is 1,102 hectares (equal to 2,722 acres), and outside the gates 3,124 hectares (equal to 7,716 acres), making a total city acreage of 10,438.

STREET CLEANING.

The city cleaning is let by contract. The contract calls for the constant and perfect cleaning of all the streets and squares, public markets, open galleries, porticos, flights of steps, Arno docks, bridges, fountains, and bases of monuments within the city limits. The contract also calls for the immediate removal of matter collected, including ill, wounded, or dead animals; the washing and disinfecting of the urinating corners, stations of tramways, omnibuses, and cabs; the deodorization and disinfection of sewers, the sprinkling of streets, the uprooting of grass from the same, etc.

The present contract is for nine years, and was made in 1897. The amount paid by the city annually under said contract is $30,000, due in monthly installments.

The contractor is under a bond of $4,000, and is compelled to provide at his own expense the personnel necessary for the service and its superintendence, the uniforms, according to patterns approved by the city government, and the appliances required for collecting and removing the matter collected to dumping places outside of the city limits. These places of deposit must be surrounded with walls 7 feet high and 1 foot thick. Telephonic communication with car and public stables is required. The contractor is held responsible for all damage done in the collection and removal of débris from public and private places. The neglect of duty in carrying out the contract subjects the contractor to a fine not exceeding $50 per diem. In cases of flagrant inattention, there is an extra fine of $100. Under the contract, the number of men to be employed is fixed at 120, the minimum wage being 36 cents per diem. Twenty-four horses are required to be kept in service. In case of snow 100 men are to be put at work immediately. From April to September, the first service must commence not earlier than 1 o'clock a. m. and be completed not later than 6 o'clock; and from October until March, the cleaning must not be completed after 7 a. m. A compensation of 6 cents is allowed for the noosing of every dog and $3 for the removal of the carcass of every horse. The contractor also has the right to sell the said carcass, metal shoes, hide, etc. All the sweepings belong to the contractor.

The present sewerage system is the ordinary one of flushed sewers. Oval tiles and pipes have been substituted for the square form, and the ancient flat-bottomed house drains have been abolished and superseded by well-trapped, air-tight tubular metal or glazed tiles with a declivity of .003. The same have been adopted for waste and water pipes in dwellings, and severe penalties have been imposed for illegal overflows from pipes.

SEWERAGE.

The cost of the present system of sewerage, when completed, is estimated at $2,800,000. No market value can be given to the unwieldy machinery now in use. The main operating intercepting sewers measure 12,080 lineal meters, equal to 7½ miles. They are built of brick, sandstone, and Portland cement. The night soil, properly mingled, is removed in several different ways, as follows:

(1) It is taken in casks of the capacity of ten gallons by farmers, who use it as fertilizers for their fields. (2) The contracting firm pumps and places it in vats, where it is stored for a limited time and sold at the rate of 20 cents per cask containing about 20 gallons. In this operation the machinery used is antique and inefficient, leaving a valuable residue. (3) When modern machinery is used, which delivers the entire deposit to the purchaser, casks of 25 gallons cost about $1.40. The first method is operated at night only. The last can be worked early in the morning or late at night. In both cases the odor impregnates

the surrounding neighborhood most strongly. The reservoirs for the collected sewage are located about 3 miles from the city limits.

Two large corporations are in the business of manufacturing the waste into a fertilizer called "poudrette" (dried night soil), which is sold at 60 cents per sack weighing about 220 pounds. Glue is made of the refuse from the meat markets, and sold to manfacturers of paints for exterior use. The waste of tanneries is condensed into cakes for fuel. Bottles, broken glass, and pottery are sold to glass works. Ashes are used for lye, old shoes are reduced to fertilizers, vegetables are converted into manure, carpet rags are used by decorators and varnishers to rub in their mixtures, and tin cans and metals are flattened out and sent to Leghorn; it is said, for export.

EDWARD C. CRAMER, *Consul.*

FLORENCE, *March 18, 1898.*

LEGHORN.

Referring to Department circular of January 20, 1898, asking for information regarding the disposal of garbage, sewage, etc., I would state that the methods in use in my district are such that a report on the subject would be devoid of any suggestions of value.

JAS. A. SMITH, *Consul.*

LEGHORN, *March 28, 1898.*

VENICE.

With regard to the report on garbage and sewage referred to in Department circular of January 20, I beg to express the opinion that a report prepared by me would be merely a waste of time for all parties concerned. The prevailing methods of garbage and sewage disposal are so superannuated as to be beneath the notice of the serious student, while not sufficiently ancient to merit the interest of the antiquary.

I regret to have been so long in forming the above expressed conviction; but the unaccountable delay of municipal authorities when addressed on the subject, three successive requests in some instances eliciting not the slightest reply, has absolutely prevented my forwarding an earlier report. I inclose herewith three pamphlets[1] dealing with the sanitary regulations of Verona and Udine. I send them in accordance with the desire expressed by the Department of Agriculture to learn of literature bearing on the general subject in question. I beg, furthermore, to mention a work entitled "La Fognatura delle Città" (The Drainage of Cities), written by Messrs. A. Cadel and F. Gosetti, of Venice, and published at 4 francs ($0.72) by L. Roux & Co., of Rome. I have not procured this book for the Department of Agriculture because I did not suppose that it would be of service.

H. ABU. JOHNSON, *Consul.*

VENICE, *November 14, 1898.*

---

[1] *Transmitted* to the Department of Agriculture.

MALTA.

Considering the facilities at hand for the disposal of garbage, sewage, etc., Malta is certainly up to date. For several years this question has received earnest attention, and large amounts of money have been appropriated by the local government to carry out its methods. The term Malta is applied to what really is a group of islands comprising Malta, Gozo, Comino, and two islets. Malta contains an area of 95 square miles; Gozo, 25 square miles, and Comino, 1 square mile, the population of all being about 177,000. Valletta, the capital and only city, is located on the largest island. In addition to Valletta, this island has numerous casals or villages. The islands are low, the highest land not being over 1,200 feet above sea level. Comparing population with area, it will be seen that they are densely populated. Upon the islands of Gozo and Comino the methods used for taking care of garbage, sewage, etc., are much the same as may be found in most of our country towns, but in Valletta and adjacent villages more attention is given to this matter. For this reason, I will confine myself to a description of the methods prevailing upon this, the largest island.

GARBAGE.

In the matter of garbage, the matter collected contains, in addition to animal and vegetable foods, tin cans, bottles, broken glass, crockery, floor sweepings, paper, and coarse rubbish, including boxes, old shoes, cooking utensils, and other materials. Animal and vegetable foods, or swill, as we term it, is collected by farmers early in the morning, and is mixed with manure and used for dressing land. Other elements of garbage are disposed of in about the same way, after being separated from the unproductive portions which are thrown away. The above applies to house-to-house collections. Although there is no fixed system, such collection is to a certain extent under police supervision.

SEWERAGE.

In the city of Valletta almost every building is connected with a sewer, into which go all household waste waters and excrementitious matter. This same sewer connection also extends to Floriana, Borgo, Durmola, and Senglea, large villages close by Valletta. The street sewer system of the above five places drains into a main sewer running from what is called St. Elmo ditch, in the northeastern end of Valletta, to the S. Rocco shores, a distance of 5½ miles. This discharges into the sea a volume of about 650 gallons per minute. At low levels, sewage is pumped into the main sewer. At St. Elmo ditch is located a reservoir, with a capacity of 500,000 gallons, which is filled with sea water. This volume is discharged into the main sewer twice a week, and, in addition, about 5,000 gallons of water are used to flush the system daily from heads of sewers. Save in the manner above described, sewage is not treated in any way. The cost of the combined pumping plants is in the vicinity of $7,250, and the average cost of running $1,410 per year. The discharge of the pumps is from 85 to 300 gallons per minute. At the villages not included in the above list, the cesspool system is in operation. A private company cleans the cesspools out at stated intervals and uses the product for fertilizing purposes, mixing it with other materials. The government has in view the total abolishment of the cesspool system, and, to this end, has secured the appropriation of a loan of £120,000 ($583,000) for the purpose of draining the whole island. There is a sewage farm in operation at the village of Sliema, in connection with the military camp near by. Here the dry-earth system is used. Excrementitious matter is removed daily, mixed with earth, and carted away by the scavenger for fertilizing purposes. The liquid matter, consisting of waste waters from the kitchens, laundries, and chambers, is admitted into sewers laid under ground and leading to large reservoirs, from which it is ultimately drawn off and applied to land previously prepared to receive it. The camp is located at the top of a hill, while the sewage farm is in a valley, and for this reason there is little or no expense for flushing, engines or pumps not being needed, gravitation doing the work. The reservoirs above alluded to are of the self-acting pattern. They are placed halfway down the hill and so constructed as to hold one-half of the sewage discharged daily. On the highest point of the sewage farm there is a tank, capable of holding an entire day's sewage, connected with the reservoirs further up the hill. In the matter of irrigation, a wide surface of land is covered. In countries like this, where the average rainfall is seldom over 18 inches, this system is calculated to answer the purpose of the agriculturist as well as that of the sanitarian. The land is laid out in furrows and ridges, and the sewage from above is carried through stone channels to that portion of the land prepared to receive it. The whole surface of the farm is not treated at the same time. The population of the camp can not be ascertained, on account of frequent changes of the troops; for this reason also it is impossible to give the volume of sewage. As to the kind of plants cultivated, besides vegetables in general, wheat, barley, Indian corn, and different sorts of vetches have been treated with sewage, and have given the following results in excess of those yielded by equal portions of land to which sewage was not applied: Crop of wheat, 12 per cent; Indian corn, 19 per cent; barley, 10 per cent; clover, 20 per cent; vetches of different kinds, 18 to 21 per cent. The sewage farm here has been in operation two years and four months.

STREET CLEANING.

The streets are cleaned by the government. The city is divided into districts, the employees in each being under a superintendent, while the police exercises a limited jurisdiction over all. During the early morning hours the streets are swept and watered. All sweepings are placed in iron receptacles located at convenient spots, and later are collected by a contractor, who mixes them with manure and other materials. This product is sold to farmers for land dressing. It is impossible to ascertain the amount which the contractor receives from those to whom he sells the material, but it does not pay his expenses, and the government pays him the difference between what he receives from the farmers and the cost of his work. The pavements in use are mostly of the block variety, although a few of the streets have been macadamized. There are no factories here, and therefore no waste products of this source. All animals are slaughtered at the government abattoir, under the direction of a medical officer. Blood is mixed with a sort of gypsum brought from Italy, and is sold to the farmers for land dressing. Dead animals are removed by a private firm here and, after being finely cut up, are boiled down, the resulting product being shipped to France for industrial purposes. The value of such products is not obtainable. The above refers to all parts of the animal except hide, hoofs, horns, and refuse. The first three are sent to France and Italy, while the latter is sold for agricultural purposes. All condemned meat passes through the same channels.

JOHN H. GROUT, Jr., *Consul.*

MALTA, *April 29, 1898.*

NETHERLANDS.

AMSTERDAM.

The population, according to the census of January 1, 1892, was 426,480 souls. The estimated population on July 1, 1898, was 507,789.

GARBAGE.

The refuse of vegetables, etc., is for the greater part collected by private parties, who come every morning with their cars. They carefully sort the refuse to remove pins or needles, and sell it to farmers or milkmen for their horses, cows, and swine, the price paid averaging 0.30 florins (12 cents) for a bag. Ashes, dust, sweepings, etc., are every day gathered by the workmen of the city cleaning service, who come with horse cars to collect it. The amount of material collected during the year 1896 was 137,921 cubic meters (36,434,590 gallons). The cost of collection during that year amounted to 85,192.28 florins ($34,247.29). The collected material is transported by horse cars and by boats to the plant of the city cleaning service, situated outside of the boundary, where it is sorted by the workmen. The city cleaning service has not been in existence a quarter of a century. In the year 1877, the municipal government undertook its management. Before that time it was given out by contract.

The quantity of refuse, ashes, etc., collected yearly amounts to 81,000 cubic meters (21,397,770 gallons), ashes and sweepings mixed; 14,000 cubic meters (3,698,380 gallons) compost; 4,500 cubic meters (1,188,765 gallons) worthless stuff; 400 cubic meters (165,668 gallons) stones; 18,000 cubic meters (4,755,060 gallons) products of cremation; 100,000 kilograms (220,000 pounds) paper; 70,000 kilograms (154,000 pounds) leather and old shoes; 7,500 kilograms (16,500 pounds) zinc, lead, copper, tin; 140,000 kilograms (308,000 pounds) tin plate; 100,000 kilograms (220,000 pounds) iron; 420,000 kilograms (924,000 pounds) black, green, and white glass; 35,000 kilograms (77,000 pounds) bones; 6,000 hectoliters (17,028 bushels) coke; 400,000 kilograms (880,000 pounds) rags, in twenty-eight kinds.

As utterly worthless stuff, 30,000 cubic meters (7,925,100 gallons) is yearly cremated. The sale of the above has brought the following amounts: In 1890, 135,000 florins ($54,270); in 1891, 140,000 florins ($56,280); in 1892, 118,000 florins ($47,436); in 1893, 162,000 florins ($65,124); in 1894, 166,600 florins ($66,973); in 1895, 136,700 florins ($54,953). The expenses for collection, sorting, and final disposal of refuse amounted during these years to 100,000 florins ($40,200).

HOUSEHOLD WASTE WATERS.

The household waste water from the kitchen and laundries is deposited in the public sewers, through pipes which connect the houses with the sewers in the streets.

The waste water from the chambers is usually deposited in the closets.

EXCREMENTITIOUS MATTER.

In the old part of the city, the closets of the houses are connected with cisterns situated under the cellars. These cisterns are built of brick, and are hermetically closed, either by heavy boards or brick arches. They are under the level of the water of the canals or street sewers, with which they are connected by small sewers. The heavy stuff sinks and the liquid is washed out in the canal or sewer. When the cistern is full, it is emptied during the night by introducing a pipe connected with an air pump on the street, which pneumatically presses the stuff into tank cars. A large number of houses occupied by the lower classes are not provided with closets connected with cisterns. The excrement is deposited in buckets, which every evening are emptied in the cars of the city cleaning service.

In the new part of the city the following system is used. Inside the houses is an iron standpipe 5 inches in diameter. The closets are connected with this pipe, but every closet is separated from the main pipe by means of a siphon. Moreover, every closet is connected with a small pipe ending outside the roof of the house, for the escape of dangerous gases. The excrement flows from the main pipe to the reservoir in the street in front of the house. A pipe goes from this to the main sewer. Two pipes end in the street reservoir, a vacuum pipe of 5 to 12 inches diameter, and a transporting pipe of 6 to 8 inches diameter. Both are connected with the central pumping station; the first is to produce a vacuum in the street reservoir, the other to transport the excrement to the central pumping station outside the city.

For emptying the closets of the houses, the connection with the transporting pipe and the main pipe is shut off in the street reservoir and the connection of the reservoir with the vacuum pipe opened. When a vacuum has been created in the reservoir, the main pipe is opened and the excrement will flow from the closets in the houses into the reservoir. Then, the connection with the main pipe and with the vacuum pipe is shut off in the reservoir and the connection with the transporting pipe is opened. Atmospheric pressure causes the excrement to be carried from the reservoir to the pumping station. The cost of this work has been: In 1890, 0.90 florin (36 cents) per year per head; 1891, 0.88 florin (35 cents); 1892, 0.74 florin (29 cents); 1893, 0.70 florin (28 cents); 1894, 0.65 florin (26 cents); 1895, 0.56½ florin (23 cents).

From the excrement, ammonia is extracted in a factory built at the plant. This factory cost 85,000 florins ($34,170). Four years ago, it produced 305,000 kilograms (671,000 pounds) sulphuric acid ammonia. It is now producing at least 650,000 kilograms (1,430,000 pounds). The liquid is transported to a tank, mixed with lime, and given time to settle. After passing two heating tanks, it is brought into a distilling tank and heated to a temperature of 110°. The gas passes through sulphuric acid, thus producing sulphuric acid ammonia. The water-carried sewage flows into the canals of the city, which are flushed two or three times a week by letting in water from the river Amstel, and letting it out on the river Y, a continuation of the North Sea Canal, whence it flows out into the North Sea.

STREET SWEEPINGS.

The streets of this city are swept by machinery during the night. The sweepings are transported to the plant of the cleaning service, where they are sorted.

Abattoir refuse and dead animals are cremated at the plant of the cleaning service.

GEORGE J. COREY, *Consul.*

AMSTERDAM, *July 21, 1898.*

ROTTERDAM.

GARBAGE.

The system of garbage collection and disposal is practically the same in all the towns and villages of my consular district, and though not modern, is considered by the people well adapted to the needs of the country. In Rotterdam, a city with a population of 300,000 people, the refuse collected consists of ashes, factory waste, street garbage, and house waste.

Ashes and house garbage are daily collected by two different carts. At a certain hour in the morning, the city regulations prescribe that receptacles for waste and ashes must be on the sidewalk in front of every house.

The pavements in Rotterdam and in all other cities in the Netherlands consist of Belgian blocks and baked bricks.

Street garbage is collected separately. Street sweepers collect and deposit it in small handcarts, which are taken to the nearest canal, where the load is dumped into a scow lying ready to receive it. The material collected by the garbage men and by the street sweepers is all taken to the so-called "mest staal" (manure pit), of which two or three are situated outside of the city limits. The ashes, if not immediately applied for filling-in purposes, are taken to sheds situated in the outskirts of the city. The cost of the collection of ashes, débris of demolished buildings, and house waste was, for the year 1895: Wages, $29,241.90; purchase and keeping in repair of material, $3,481.55; total, $32,723.45. For 1896, wages amounted to $31,505.56; purchase and keeping in repair of material, $4,014.11; total, $35,519.67.

The foregoing figures, however, are not quite correct, the cost of the horses, harness, feed, medical attendance, and taxes not being included. The horses are also used where the distance from a canal makes the use of a handcart impracticable for drawing carts in which street garbage or excrementitious matter is collected, and for drawing street sprinklers. For that reason, a separate account has been made for the stables.

The expenses incurred on account of horses, stables, etc., were, in 1895, $16,244.12; in 1896, $17,329.12. The work of collecting is done by the garbage department, at the expense of the city. The cost of keeping the streets clean was as follows:

Year.	Sweeping and collecting.	Keeping urinals clean.	Disposing of snow.	Purchase of material and disinfectants.	Total.
1895	$20,402.84	$734.00	$3,102.11	$2,333.53	$26.572.48
1896	23,317.74	742.00	954.64	2,163.93	27,178.31

The house waste and street garbage, either mixed or separated, is sold from the manure pits to the farmers for fertilizing purposes. The ashes and débris from demolished buildings, such as broken brick and lime, are either sold to private persons or are used by the city for filling-in purposes. The country being low and swampy, there is always a fair demand for this kind of stuff. The commercial value of the products fluctuates. The price of ashes, broken brick, etc., averages 70 cents per 100 cubic feet; the price of manure—that is, a mixture of *street garbage* and house waste—averages 80 cents per 100 cubic feet.

There are no special methods in use for the collection and utilization of tin cans, bottles, broken glass, crockery, sawdust, grease, paper, and bones. This material is sorted out. Tin cans are sold to a very small extent; most of them are flattened and thrown among the ashes and débris intended for filling up. Crockery serves the same purpose. Broken glass, bottles, paper, rags, and bones always find buyers for manufacturing purposes. The income derived from the sale of the last-mentioned articles amounted in 1896 to $1,739.52.

Substances that can not be used for filling up or for fertilizing purposes and can not be sold are cremated and the ashes mixed with the house waste and street garbage; but as there seems to be but little of such worthless rubbish collected, cremations, which take place at the manure pits, do not occur very frequently.

The present method of collection of garbage has been in use since 1876. It was then that the city undertook the management, and organized the present garbage department under the supervision of a director. Before that time the work had been done by contract, which was found to be unsatisfactory in a city of the size of Rotterdam, then having a population of 136,230. The manner of disposal of the garbage was, however, pretty much the same as it is now. The tools, implements, teams, manure pits, stables, and sorting and mixing sheds all belong to the city.

EXCREMENTITIOUS MATTER.

In the old city of Rotterdam, every house is either connected with the public sewer or with one of the numerous broad canals emptying into the river Maas for the removal of excrementitious matter. In the former villages of Charlois and Kralingen, recently added to Rotterdam, a good many houses are not yet connected with the public sewers or canals, and are either provided with cesspools, which are pumped out from time to time, or with small kegs which are used in the water-closets and changed daily or semiweekly. It is impossible to estimate the number of houses so provided, but it is probable that nine-tenths of the population use the water system for the removal of excrementitious matter. Within a very short space of time, I have been informed, every house in the city will be connected with the public sewers or with one of the broad canals—in reality, side arms of the river Maas. The removal of the excrementitious matter from the cesspools and from the houses, where kegs are used, is also attended to by the city garbage department. This is taken to a covered plot, a good distance from the city, where most of it is mixed with street garbage and sold under the name of "compost" for fertilizing purposes. This material brings as much as $1.40 per 100 cubic feet. The demand for the article is good, but the value has decreased of late on account of large importations of artificial fertilizer. Unmixed excrementitious matter is, when dried, also sold for fertilizing purposes, and brings $1.70 per 100 cubic feet.

The director of the city garbage department told me that as long as the farmers of the surrounding country needed fertilizer, the demand for the various articles of garbage mentioned would be good, and in his opinion the present method of disposing of Rotterdam waste was more remunerative than would be that of cremation.

The cost of collecting and mixing the excrementitious matter was, for 1895: Wages, $12,593.93; purchase and keeping in repair of material, $2,731.22; total, $15,325.15. For 1896: Wages, $13,604.65; purchase and keeping in repairs of material, $2,056.11; total, $15,660.76. During the year 1895, receipts derived from the sale of the following items amounted to: Manure, $13,909.38; ashes, brick, etc., $1,488.37; excrementitious matter, $3,295.78; various, $12,099.99; total, $30,793.52. The receipts for 1896 were: Manure, $14,831.08; ashes, brick, etc., $4,602.67; excrementitious matter, $3,586.97; various, $8,548.21; total, $31,568.93.

Household waste water from the kitchen, laundry, and chambers runs into the public sewers, into the canals, or into the small sewers or covered ditches connected therewith.

There are no factory-waste products of agricultural or sanitary interest produced in the city of Rotterdam.

WATER-CARRIED SEWAGE.

In 1895, a report on sewerage for the city of Rotterdam was compiled by my predecessor. As the system and conditions have remained the same, I quote extracts from that report:

> The greater part of the city of Rotterdam lies below the level of the sea, as well as below the level of the river Maas, on which it is situated. The construction and operation of a satisfactory system of drainage are thus accompanied by difficulties of a rather unusual nature, which, however, have been successfully overcome.
>
> For sewerage purposes the city has been divided into three distinct sections, each provided with a large pit or basin, into which the foul sewage, as well as the surface water, is collected by means of the ordinary combined water-carriage system. The sewer pipes are made of strong cement and are egg-shaped—that is, their cross section presents the outlines of an egg resting on its apex. This form facilitates the flow of sewage when the pipes are but partially filled, a matter of great importance where the gradient is necessarily very slight.
>
> When the surface water and waste house water are insufficient for flushing the sewers, water from the numerous canals and ditches that intersect the city and environs is easily obtained. By this means, the sewers are thoroughly flushed and cleansed at regular intervals. The loss of water to the canals is made good from the river, and by the circulation thus secured they are kept tolerably fresh.
>
> #### DISPOSAL OF SEWAGE.
>
> By means of powerful steam pumps the sewage thus collected in the basins is discharged through iron pipes into the river. Pumps of American construction (the Worthington) have lately been introduced and are found very satisfactory, both as regards work done and fuel consumed. At the largest pumping station two of these pumps, of a combined capacity of 80 cubic meters (2,825 cubic feet) per minute, are now in operation, and a third pump of an older and different construction is kept in reserve. The sewage thus discharged is absorbed and carried off, without any apparent pollution, by the vast volume of the river, which at this point is about one-third of a mile broad and from 25 to 30 feet deep, and is computed to empty daily into the sea some 70,000,000 cubic meters of water.

There is, however, one point of danger. The reflux of the river for four hours during flood tide carries the sewage from the upper or eastern pumping station back beyond the prise d'eau (intake) of the public waterworks. To prevent the possible pollution of the city water from this source, no water is taken into the basins or reservoirs of the waterworks until two hours after the inception of ebb tide.

COST.

The total cost of the sewerage system of Rotterdam can not be stated, as it has been constructed at different times and parts of it in connection with other public improvements. The whole system, however, has been overhauled since 1889 at an expense of 1,000,000 florins ($400,000). This includes the purchase of the Worthington pumps now used. The annual expense for operating the pumps and maintaining the machines and buildings connected therewith is about 43,000 florins ($17,200).

The system of the disposal of sewage is practically the same in the principal cities of my consular district. Holland has such a network of canals, most of them with running water or with water let in and out by means of sluices, connecting cities and villages with the principal rivers, Rhine, Maas, Yssel, and Schelde, that these canals are naturally made use of for carrying the sewage to the rivers and to the sea. Where there are no rivers or canals the cesspool system is used.

FACTORY WASTE, ETC.

There are no factory-waste products of any agricultural or sanitary interest produced in the city of Rotterdam.

Market and abattoir refuse is collected with the street garbarge.

DEAD ANIMALS.

The larger kinds of dead animals, such as horses, cows, sheep, goats, and hogs, are taken to the slaughter yards, where the city owns a plant for the preparation of fertilizer from the bodies of dead cattle and parts of meat unfit for consumption. The method in use is according to the system "De la Croix Willart." The dead animals and parts of flesh are put into a huge closed kettle, into which steam is admitted at a pressure of 4 atmospheres at 180° Celsius, for eight hours. The steam causes the flesh and bones to become dry and to fall apart, and drives the fat to the bottom of the kettle and through a tube into another kettle. When the flesh and bones are taken out, they are spread on racks and exposed to the sun. When thoroughly dry this material is ground and sold as a fertilizer. The fat is purchased by the manufacturers of machine oil. The material put in the kettle shrinks from 50 to 60 per cent, as from 25 to 30 per cent of flesh pulp and from 15 to 20 per cent of fat are obtained. The flesh pulp, when dried and ground, sells from $5.60 to $6.40 per 100 kilograms, or 220 pounds, the grease at from $14.40 to $19.20 per 100 kilograms. As to the cost or profit of the above establishment to the city, nothing can be learned. The plant is operated by a private person who, in payment for rent, collects the dead animals before mentioned in the city, and is allowed the profit derived from the disposal of the same in the above manner.

Carcasses of dogs, cats, and birds are taken to the manure pits by the city garbage department and used with the street garbage.

S. LISTOE, *Consul.*

ROTTERDAM, *April 26, 1898.*

RUSSIA.

ST. PETERSBURG.

St. Petersburg, with a population of 1,267,023, has adopted none of the modern methods of collecting and disposing of waste, garbage, sewage, dead animals, etc. The city pays for sweeping the streets, dumping the sweepings in low places about the city; droppings are collected and put in iron boxes holding about 2 bushels sunk in the street near the curb, the contents being removed by gardeners, who also take the manure from city stables; but each house owner pays garbage collectors for removing house garbage, kitchen slops, etc. Dead animals are removed to a bone factory in the city, where their bones are converted into fertilizing material, soap, and glue. Clean waste paper is collected for the government card factory, the profits from the sale of cards going to a charitable fund.

W. R. HOLLOWAY,
Consul-General.

ST. PETERSBURG, *March 16, 1898.*

SPAIN.

BARCELONA.

Garbage and other kinds of refuse found in the streets of Barcelona are carted every day to the country by farmers who have secured the right from the city corporation, in return for the payment of a small sum of money, to appropriate them. At the farms they are fed to the live stock or are used as manure. From private houses, refuse is collected and carted away in the same manner. All the methods used are simple and primitive. The cleaning of the streets after the garbage has been removed is done by the city, and, as a rule, well done. The drainage of the city has been improved somewhat during the last ten years, but in the poorer parts there are still many houses that are supplied only with deposits for excrementitious matter.

HERBERT W. BOWEN,
Consul-General.

BARCELONA, *March 1, 1898.*

CADIZ.

The systems of disposal of garbage and sewage in this city are of the most primitive description and have been in vogue for hundreds of years. Cadiz, according to the census of December, 1897, has a population of 69,000. There is no way of ascertaining the quantity or exact nature of the garbage, as it is collected every morning by the dust carts and is immediately thrown into the sea. This work is done by the municipality. All houses are supposed to be connected with the sewerage system, and waste water should go through the same, but in a large proportion of the houses, there is not this connection and the water flows into cesspools and is allowed to percolate through the soil. The majority of the houses are not provided with water to carry off excrement, and many that have connection with the sewers take no advantage of it and allow the matter to find its way off as it can. Where there is no connection, the cesspools are emptied when full and the matter thrown into the sea.

All the sewers in Cadiz lead into the sea, and in the other large cities of this district into the nearest river or stream. The sewers are arranged according to various systems, in order to provide for the outfall at the sea level. No pumps or other artificial methods are used to propel the sewage or flush the sewers.

The utilization of sewage is not practiced in cities of this district, and although in some of the inland cities the local market gardeners make arrangements to take the garbage and waste from the city scavengers, there is no systematic use of the matter as fertilizer.

The streets here are swept every morning and the sweepings, together with the garbage, thrown into the sea. At Jerez, Seville, and other places it is carted a few hundred yards from town and allowed to evaporate or sold for a nominal sum to the market gardeners, who, however, do not care to pay for the carting. The few factories at Seville allow their waste to run into the river.

In Cadiz, the slaughterhouse is built on the sea and all refuse thrown into the sea, as well as all animals, except cattle, pigs, and sheep, which are cremated in order to prevent them being sold for food.

JOHN HOWELL CARROLL, *Consul.*

CADIZ, *March 14, 1898.*

CORUNNA.

Referring to Department's circular of January 20, 1898, I beg leave to say that for the purpose in view it is unnecessary to submit a detailed report on the means employed in the cities of this consular district for the collection, removal, and final disposal of waste materials of all description, since such means are either deficient or primitive and generally inconsistent with the principles of hygiene.

JULIO HARMONY, *Consul.*

CORUNNA, *March 9, 1898.*

MALAGA.

Referring to the Department's circular instruction of January 20, I regret to state that the methods in use here for the disposal of garbage, sewage, and other waste materials are the most antiquated imaginable. In consequence, a report upon the subject would be of no interest to the Department.

R. M. BARTLEMAN, *Consul.*

MALAGA, *March 2, 1898.*

SWEDEN AND NORWAY.

GOTHENBURG.

Although this is a city of about 120,000 inhabitants, the methods used here seem to be primitive, in certain respects at least. There may be found something of value in them, however, and a short report is submitted.

GARBAGE.

Previous to January 1, 1885, each house owner or landlord had to make contracts with farmers in the vicinity in order to get garbage, etc., carted away from his premises, but from the day mentioned the city cleaning department (Göteborgs Stads Renhallningsverk) took charge of this matter for house owners who applied for it. The number of those who applied within one year was 900; it is now 2,600. There are left, however, about 1,000 real estates where cleaning is done by contractors, generally farmers. Inspectors serving under the board of health see to it that these contractors, as well as the men belonging to the cleaning department, keep the premises clean in conformity with the sanitary regulations. The work is done in the following way: Sweepings from yards and streets, ashes, and waste matter from the kitchens are collected daily and carted away to certain places, where the garbage is dumped into flat-bottomed lighters, which are towed up the river to points where the garbage can be delivered to farmers who have bought it for fertilizing purposes. The price is 10 öre per hektoliter (about 1 cent per bushel), on condition that the purchaser of the garbage brings it ashore himself. Total amount collected and sold per annum is about 300,000 hectoliters (851,400 bushels).

SEWERAGE.

Sewer wells within respective premises are cleaned from solid matter at least twice a month, and the filth is directly carted away by the cleaning department or by a contractor. In the summer, the wells are washed out several times with clean water.

It is by law provided that each house owner shall have on his premises a closet, where excrementitious matter shall be received into a tight box or bin provided with wheels and running on rails, and the *matter* collected therein is daily mixed with lime or with dried peat.

This is done by laborers employed by the cleaning department, and the lime or peat moss is paid for by said department. The excrementitious matter treated this way is taken away by carts with tight-fitting covers to a certain place set aside for this purpose, where it is put into special railroad cars, which convey it daily to a place some distance from the city. There it is further mixed with peat or lime, dried, and is finally sold as fertilizer under the name of "pudrett." The selling price of this article is 95 öre per hectoliter (about 9 cents per bushel) if mixed with lime, and 33 öre per hectoliter (about 3 cents per bushel) if mixed with peat.

The expenses for the work above mentioned, for the 2,600 houses or real estates in question, amount this year to 260,000 kronor ($69,680). These expenses are partly paid by taxes assessed for this purpose, partly by amount received for refuse matter, and "pudrett" sold. The balance is covered by contribution from the city funds, which contribution will probably amount to 25,000 kronor ($6,700) this year.

Gothenburg is situated near the mouth of Götha River, and a brook flows through the city. The water from this brook or creek and some water from the river flows through the canals within the city, and also into the old moat. The sewage from the city within the moat is let out into the largest of the canals leading to the river, and from the suburbs the sewage is conveyed direct to the river, which is supposed to carry it out into the sea. The fact is, however, that some of the solid matter, which is not or can not be collected in the sewer wells, settles on the bottom of the canals, and dredges are used to take this dirt away. It can hardly be said that this system is satisfactory from a sanitary point of view. During dry summers, when the water supply from the brook and the river is less than usual, the water in the canals is often almost stagnant. It has been proposed to convey all the sewage directly to the river. One of the smaller canals is now being filled, and the sewage which formerly was emptied into this canal is now carried farther out, where it will be removed by the river.

A small pumping plant is used for elevating the sewage from two suburbs before it can be let out into the river. This system of emptying the sewers has not been adopted yet for other parts of the city. Water-closets are very little used, and where used have separate sewer wells. The sewage is not disinfected and is not employed for any purpose.

At the close of the year 1897, the length of the sewers within this city was as follows:

	Feet.
Sewer mains of hard-baked clay	249, 336
Sewer mains of beton (cement and sand)	39, 632
Sewer mains of brickwork	20, 946
Sewer mains of iron	98
Sewer mains of granite	3, 293
Branch sewers	155, 656
Total	468,961

The average expense for the maintenance of these sewers and the sewer wells during the last five years has been $1,192.92 per annum. I am informed that the systems in use in other Swedish cities are similar to the one above described.

STREET CLEANING.

Since the year 1892, the city cleaning department has charge of the cleaning of paved streets, market places, and squares. The department receives for this purpose an allowance of 21,000 kronor ($5,628) per year from the city treasury. This work is done every day before 8 o'clock in the morning.

No part of the garbage is collected for special purposes by the cleaning department. When the garbage is loaded into the lighters, everything unsuited for fertilizing purposes is taken away and used for filling-in material. The laborers doing this work are allowed to collect and sell for their own benefit all bones, rags, broken glass, pieces of metal, etc., found in the garbage. The cleaning of macadamized streets and open places is in charge of the street and road department (Gatu- och Väg-förvaltningen). This is done in connection with the maintenance (and sprinkling in the summer time) of said streets and squares, and the cost of same amounts to $5,360 per annum.

ROBERT S. S. BERGH, *Consul.*

GOTHENBURG, *May 21, 1898.*

CHRISTIANIA.

Christiania, Norway, is a city of some 205,000 inhabitants, and the population is fast growing. The increase was 10,000 in 1896 and 13,000 in 1897. New buildings, many of them large, are being erected in all quarters, and new streets opened.

GARBAGE.

The best method for the disposition of garbage is becoming a serious question, as the city is located at the end of a bay where no currents assist in keeping the waters pure. For this reason, the regulations forbidding any sort of garbage, refuse, and excrements to be dumped in or led to the water are very strictly enforced. Garbage, such as waste of animal and vegetable food, is carried from the kitchens to large waterproof and covered boxes, mostly made of iron, which, according to official regulations, must be placed and kept in every back yard. Ashes are also dumped in these boxes, but no fluids of any kind. Those belonging to hotels, restaurants, and dwellings in the central portions of the city must be emptied every twenty-four hours; those in the suburbs, every forty-eight hours. There are several private companies who undertake the care of these boxes for a consideration, but since

January 1, 1898, the city government has established a branch office to take charge of the matter, and the private concerns will in all probability gradually withdraw. A crematory for the disposal of garbage and refuse is under consideration. Under the present system, the house owners have to pay for removal. The stuff is utilized as manure; it is generally sold to farmers by the private companies and used on a farm by the city. The cost of removal can not be stated. Tin cans, broken glass and crockery, ashes, sawdust, floor sweepings, grease, paper, and other coarse rubbish are also put in the boxes and removed in the same manner, by covered wagons. The articles are utilized in different ways.

SEWERAGE.

Household waste water from the kitchen, laundry, and chambers generally goes to the public sewers. The city has about 140,000 meters (459,000 feet) of sewers, and extensions in all directions are now under construction. In houses having sewer connections, all waste water is emptied through receivers placed in each story of the buildings. In houses located in districts outside of the system, it is emptied into waterproof boxes, in water-closets, and regularly removed. At the present writing, at least three-fourths of the city buildings have ample sewer connections.

No excrementitious matter is water-carried. Water and air tight reservoirs are required to be used in the closets, and the contents are removed every twenty-four hours, at night. They are carried away from the city in cars and in barges so constructed that the contents give no offense to smell or sight. The matter is used as fertilizer, some going to the city farm, and some being sold to farmers. The receipts fall far short of the expenses. The house owners have to pay for removal, and the whole is under very strict police surveillance, examinations of the buildings and yards being often made.

The sewerage system in use is simple, but quite effective. The pipes are so laid as to allow sufficient fall, and as the presence of excrements or solids of any kind is prohibited in the sewers, they are readily kept clean, and discharge their contents in the bay. Expenses in 1896, $18,000.

STREET CLEANING.

The streets and market places are cleaned by horse sweeping machines and by hand. For the collection of horse manure from the streets, boys are employed. Each has his appointed beat, and removes the manure by broom and pan, depositing it in boxes placed at alley corners. These boxes are emptied every day, and the contents are removed together with the street sweepings. The stuff is used as a fertilizer and is removed by horses and covered wagons. All of these operations are performed by the city government. The areas are as follows: Stone-paved streets, 268,000 square meters (2,884,752 square feet); macadamized streets, 690,000 square meters (7,427,160 square feet); stone-paved sidewalks, 220,000 square meters (2,368,080 square feet); gravel-covered sidewalks, 290,000 square meters (3,121,560 square feet).

In the budget for the year 1898, the city government estimates the expenses for collecting and disposing of street, sidewalk, and market place sweepings as follows:

	Kronor.
Officers' salaries, rents, etc	15,000=$4,020
Cleaning stone-paved areas	75,000=20,100
Cleaning other areas and gutters	60,000=16,080
Removal snow and ice	48,000=12,861
Sprinkling	36,000= 9,648
Sand put on ice-covered sidewalks	22,000= 5,896
Repairs tools, wagons, etc	8,000= 2,144
Removal horse manure	35,800= 9,594
Total	299,800=80,346

This is an estimate, and it should be remembered that 1898 is the first year in which the city has undertaken the care of sidewalks, which before had to be attended to by the house owners. The stone-paved streets are considered the cheapest to keep in repair. They are rough and noisy, but easily kept dry and in good condition. They are laid in cubes about 7 inches square, the sizes varying.

Solid and liquid factory wastes are utilized in different ways; so far as I can learn, none of them are of special agricultural or sanitary interest. Sawdust from the sawmills is sold for bedding in barns; refuse from metal-working plants is sold to foundries. All wastes must be disposed of in some manner, so as not to endanger the public health or block the public roads.

Market and abattoir refuse is disposed of as street sweepings.

ANIMALS.

There are no methods in use for the industrial or agricultural utilization of the carcasses of dead animals, but they are promptly removed and disposed of.

The systems in use in the smaller towns in my consular district for the removal of all sorts of refuse are similar to those of Christiania.

HENRY BORDEWICH, *Consul.*

CHRISTIANIA, *March 26, 1898.*

SWITZERLAND.

GENEVA.

This report has been held with the expectation that persons who have promised, from time to time, to furnish detailed information concerning the sewerage system in the cities of Lausanne and Vevey would finally do so. But I have concluded to wait no longer. It may be briefly stated that the system of collecting and disposing of garbage in Lausanne and Vevey and the other cities of this district is substantially the same as in Geneva. The sewerage system at Lausanne is different, however.

GARBAGE.

The removal of rubbish and refuse in the city of Geneva is operated according to a very simple system, which excludes any industrial processes. The population of the city, properly speaking, is 60,000. The suburban communes bring the population up to 80,000, and the same regulations are applied to all. For the city alone, the household refuse collected annually amounts to 36,500 cubic meters, or 20,000 tons. The refuse is each morning placed in iron boxes upon the pavement in front of each house. The dust carts arrive and the men empty the boxes and leave them. These carts are taken to different rubbish deposits situated in the country, within reach of agricultural centers. The manure supplied by these heaps of refuse is sold direct to the farmers, either fresh or hard, according to the season. This service was formerly undertaken by public contract, but for the last eighteen years, it has been operated by the municipality.

All broken glass, crockery, iron, and other metals are set aside and collected in special carts, which are sent every Monday through the streets.

The chemical composition of the household refuse collected in the city of Geneva is not known to have ever been ascertained scientifically; it varies, moreover, according to the season, the different quarters, atmospheric influences, etc.

SEWERAGE.

Household and kitchen slops, as well as excrementitious and rain water, flow into the public sewers in every street. Nearly all the houses in the city are in communication with the sewers. All apartments, with very rare exceptions, are supplied from the municipal waterworks.

The sewers find their outlet in the River Rhône, or in its tributary, the Arve, the Rhône flowing through the town proper (after leaving the lake at the commencement of the town) and the Arve through the Plainpalais quarter and the suburb of Carouge (population, 6,000).

In Geneva, there exists but one system of sewers. The sewage is not used at all for the irrigation of cultivated land, nor is any pumping plant employed. No process of filtration is employed.

STREET CLEANING.

The street sweepings—dust, animal excrement, etc.—are collected by the employees of the "voirie" (street-cleaning department), and are disposed of on the refuse heaps mentioned above. The municipal budget provides for an annual expenditure of 180,450 francs ($34,827) for the removal of refuse. The receipts arising from the sale of the manure hardly reach 40,000 francs ($7,720). The agricultural value of the refuse does not depend on the system of paving employed for the streets, but varies considerably according to the season. The larger proportion of coke ashes found in the winter refuse lowers its commercial value considerably.

There are in this city no industries supplying factory wastes which call for any special regulations.

ANIMALS.

The city slaughterhouses are situated on the bank of the Arve; all waste waters and liquids not utilized flow into this river.

Dead animals are taken to the yard termed the "clos d'équarrissage," or "cutting-up yard." The carcasses are destroyed by means of the "Girard process," viz, the flesh is plunged into wooden tubs, lined with lead, containing a solution of sulphuric acid at 65 per cent, and is converted into an agricultural fertilizing product. From 80,000 to 100,000 kilograms (176,000 to 220,000 pounds) of flesh are treated annually by this method in Geneva. The only by-products left over in this process consist of a few fats, which are utilized for industrial purposes.

The cost to the State of this system of disposing of carcasses is as follows: 2,000 francs ($386) per annum for the rental of the ground; the interest on 60,000 francs ($11,580); the initial cost of the "yard" with the material, and the salary of the janitor. In the above sum of 60,000 francs, however, are included at least 30,000 francs expended for supplies not directly connected with this plant. This concern is given over to a contractor, who manufactures the manure on his own account and pays 1,500 francs ($289.50) per annum to the State for the rental of the building and material. The rent thus charged is, of course, less than minimum, but the State's sole object is to promote public hygiene. This process gives most satisfactory results, both from a sanitary point of view and because it produces an excellent fertilizer for agricultural purposes.

REGULATIONS.

The following are the city regulations concerning the removal of refuse and household wastes, pavement sweepings, etc., as adopted by the administrative council of the city and approved by the council of state of the Republic and Canton of Geneva, in November, 1897:

It is forbidden in the city of Geneva to deposit in the public thoroughfare any refuse, sweepings, or ashes.

Each house must be supplied, at the landlord's expense, with one or several receptacles, according to its size, to receive the sweepings and refuse of the households dwelling in the building. These receptacles must be of iron and furnished with two handles. They must be placed at the doors or at the entry of the courts and passages, ready for the dust carts to pass. In cases, however, where no janitor is attached to the building, the employees of the "voirie" (street-cleaning department) will carry the boxes out of the houses, i. e., provided they be placed on the level of the street and at a distance not exceeding twenty meters from the edge of the pavement. They will likewise put them back in their places.

In case of any disagreement between joint proprietors, these regulations are to be carried out by the more diligent of the landlords, after having called attention to the refusal of the others, and reserving his rights to appeal against the same.

All household sweepings and wastes must be deposited in the iron boxes above referred to, between 6 and 6.30 a. m. from April 1 to September 30, and between 7 and 7.30 a. m. from October 1 to March 31.

In streets and squares where markets are held, the boxes must be placed out between 12 a. m. and 1 p. m. on Wednesdays and Saturdays; on other days as above. The same regulations extend to all houses situated in courts, alleys, passages, culsde-sac, etc.

The contents of the boxes must be emptied into the carts by the employees of the "voirie."

The shops and their approaches must be swept before 7 a. m. in summer and 8 a. m. in winter. It is strongly advised to sprinkle water before sweeping.

BENJ. H. RIDGELY, *Consul.*

GENEVA, *August 25, 1898.*

ST. GALL.

The sewer and garbage systems of St. Gall are primitive, and while the authorities are very energetic and alert in applying all the methods at their command for keeping the city clean and in good sanitary condition, improvement is being demanded and will be carried out in the near future. No real modern methods are at present in use.

St. Gall is situated in the northeastern part of Switzerland and is about 2,200 feet above the sea, it having the highest altitude of any city in Europe. The location is such as to give the city an excellent drainage in two directions—one northeast toward Rorschach, on the Lake of Constance, and the other southwest toward the valley of the Sitter Creek. St. Gall has about 35,000 inhabitants. It has no regular sewerage system at present, but plans are being made for one, and work upon it may be commenced next year, though this is uncertain. The main difficulty in carrying out the projected system is the protest of the citizens of St. Gall and those of the adjoining Canton Thurgau against the manner of disposing of the sewage. Two plans are proposed—one to carry the sewage into the Sitter Creek southwest of the city; but the Sitter flows for many miles through the Canton Thurgau, empties into the Thur, and finally into the Rhine, after it leaves Lake Constance. The citizens of Thurgau emphatically object to having the sewage of St. Gall pass through their territory on its way to the Rhine, and this scheme seems impracticable. The other plan is to lay large sewer pipes from St. Gall northeast to Rorschach, on the shores of Lake Constance, and to carry the pipes far out into the lake, so as to avoid any objection on the part of the people of Rorschach; but this plan finds strong opposition in the city of St. Gall itself, whose citizens get their fine water supply from Lake Constance, and who object to having sewage pollute their own drinking water. Experts say that this objection is groundless, because the lake water that supplies St. Gall is so thoroughly filtered that not a microbe of the St. Gall sewage could ever get back to the city through the water pipes; but the thought of having all of the St. Gall sewage go into Lake Constance and all of the St. Gall water come from Lake Constance is more than the people of the famous Embroidery City can endure, and they solemnly protest against this second plan. Thus the only two ways in which the city can be sewered are blocked by the loud protest of citizens, and in Switzerland, the voice of the citizen is the power behind the Bund. These are the questions that now confront the municipal authorities of St. Gall. They will probably be solved by sewering into Lake Constance by way of Rorschach, but with pipes extending so far out into that deep body of water that no real danger of pollution will be possible.

SEWERAGE.

The present sewer system of St. Gall is, as before stated, quite primitive. Two small streams, fed by springs, flow through the city, and they have been turned into a sewer for a small portion of the town. These sewers are used only for waste water, slops, etc., no closet refuse being allowed to enter them.

The municipal authorities are alive to the necessity of keeping the city clean and of improving its sanitary conditions. They contract with parties for the prompt cleaning of all closet reservoirs. The contractors must furnish the men, wagons, and horses necessary to perform this work, according to certain rules prescribed by the city. They are permitted to sell the contents of the closet reservoirs, which are located just outside of the building foundation, and in a position to be easily emptied. This is done by hand pumps that force the refuse into a large cylinder cart. The refuse the contractor is permitted to sell to farmers, and the revenues from these sales are his perquisites. Each house has a small reservoir, into which flows all refuse from the closets. When it needs emptying, the house owner must notify the police, who promptly send the contractor to do the work. Whenever these reservoirs receive the waste water from the kitchen, the house owner is compelled to pay two-thirds and the city one-third of the cost, but where the reservoirs do not receive any waste water—that is, where houses have no water privileges—the contractor collects the refuse at the cost of the city, which, owing to the fact that the contractor is able to sell this refuse to the farmers, is not very large.

The city owns one large reservoir, located not far from the city limits, and the contractor owns one. Into these, all the refuse from the cylinder carts is emptied. It is sold from the reservoirs to the farmers, who buy it at from 40 to 50 cents a load and haul it sometimes long distances into the country. Often, the farmers come into the city with their teams and take the cylinder carts to their farms after they have been filled, thus saving considerable labor. Most of the refuse taken by the farmers is hauled away in winter and early spring. In summer, the farmers being busy with their agricultural pursuits, sometimes do not find time to empty the large reservoirs, and these become full to overflowing. Then, as soon as a heavy rain occurs—and fortunately heavy rains are frequent in St. Gall—the currents of the little streams upon whose banks the reservoirs are located are turned into them and the contents are washed away and disappear by evaporation and absorption, which for the time being results in the lively discomfort of the neighborhood. During the fiscal year 1896–97, the cost to the city for the removal of closet refuse was $4,525. This amount would have been greater had the contractor had not the revenues from the sales.

REMOVAL OF GARBAGE.

The removal of garbage of St. Gall is done by contract. The men and horses are furnished by the contractor, and the city supplies the wagons and gives the contractor daily instructions as to what streets he is to inspect. He visits these with his wagons and men, and they collect all of the garbage, which is placed on the front pavements, usually close up to the building line, and sometimes in the alleys. The residents always know when the garbage collector is to come, and they are compelled by law to have it all ready for collection. The refuse is usually placed in large cans, boxes, or buckets. Ashes, broken glass, crockery, tin cans, old shoes, sand, stones, etc., are placed in one receptacle, and everything that will do for fertilizing purposes in another. No direct charge is made to the houses or factories for this work. The contractor is permitted to sell all of the refuse he can, and he is able to sell most of it for filling in land and for fertilizing. Nothing is wasted in this country.

During the fiscal year 1896–97, the city paid the following amounts for cleaning the streets and collecting the garbage: Wagons and machines for cleaning streets and hauling garbage, $325; cleaning streets, $4,980; hauling garbage from houses and factories, $3,400; taking away and burying dead animals, $40. For the removal of dead animals, a man is selected by the authorities and receives a small fee for each one he buries. If the carcass is taken from private property, the owner must pay; if from the streets, alleys, or parks, the city bears the expense. There is a severe penalty for placing dead animals of any kind in the streets, alleys, or parks.

CLEARING AWAY SNOW.

As considerable snow fell during the month of February, I had an opportunity to observe the manner in which the authorities of the canton of St. Gall handle their severe snowfalls. About the middle of February, snow fell to the depth of 2 feet in twenty-four hours. The next day I took a sleigh ride for the purpose of ascertaining how this great mass of snow would affect travel. I was on my way by 10 o'clock in the morning and I drove at least 25 miles, and everywhere I found the highways had already been put in excellent condition by the snowplows. These plows are V-shaped, and are built of planks and strongly ironed. Two teams are attached to each plow, which presses back all the snow for about 12 feet and leaves some 6 inches of packed snow on the roadbed, which makes good sleighing. The sidewalks and frequently-used paths are made passable by 1-horse plows, which make a furrow about 4 feet wide and leave but little snow on the walk. In all directions, these walks leading away from the towns had been put in passable condition in less than ten hours after the storm had occurred, so that the inhabitants of the several districts could travel with ease and comfort. In the cities, men are kept actively engaged in removing all the snow that falls. Very often, large traps are made in the sewer pipes, and the snow is collected in carts and dumped into the sewers, through which living streams flow. The cost of all the street work is met by taxation. The public roads are cared for by the different cantons, and the general government also contributes something for the great thoroughfares.

JAMES T. DUBOIS,
Consul-General.

ST. GALL, *March 7, 1898.*

ZURICH.

The population of Zurich numbers 160,000, an increase of 37,000 since January 1, 1894.

SEWERAGE.

The collection of human excrement, garbage, etc., and the disposal thereof, is performed by the city government, under supervision and direction of the health department. Excrements are collected in iron receptacles, placed in vaults which are connected with the sewerage system, and outside of the line of the, system, in cesspools. Solid matter (about 15 per cent) only remains in the receptacles, all the liquid substances being allowed to run off into sewers with which they are connected. The iron receptacles, when filled, are closed hermetically with screw-top lids, collected by the city wagons, and carried away without obnoxious results. This work is performed in daytime and gives rise to no complaints. Contents of cesspools are lifted by pneumatic pumps into tank wagons, also by the city (except where owners perform this work themselves and use the contents to fertilize their lands), and emptied into sewers. The annual product from this source, based on a population of 150,000, can be put down at 75,000 cubic meters (2,648,745 cubic feet). Of the above,16,000 cubic meters (565,066 cubic feet), the product of cesspools, and 7,000 cubic meters

(247,216 cubic feet) from vaults, were disposed of for fertilizing purposes and the balance emptied into sewers. The net cost for the collection and removal of the above-mentioned matter was, for 1897, as follows:

	Francs.	
Receipts	170,854.15 =	$32,980.64
Disbursements	218,341.62 =	42,139.93
Deficit, or net cost to the city government	47,487.47 =	9,159.29
Resources:		
Sale of fertilizers	4,949.60 =	$954.27
Contribution by landlords	138,934.55 =	26,845.25
Total	143,884.15 =	27,799.52

Landlords pay 80 centimes (15 cents) for each tank collected and removed, and fertilizer is sold at 2 francs (about 38¾ cents) per cubic meter.

Number of tanks collected in 1897, 173,456; product of above, 6,541 cubic meters (231,006 cubic feet), of which 2,543½ cubic meters (89,828 cubic feet) were sold, and 3,997½ cubic meters (141,178 cubic feet) used on agricultural lands, owned by the city, after having been reduced into liquid manure for that purpose. The area of the city's land holdings is too limited to absorb all of the supply, hence the authorities were compelled, where takers could be found, to give away a portion and empty the surplus into sewers.

Cesspools yielded 8,649 cubic meters (305,453 cubic feet). Of this, 28 cubic meters (989 cubic feet) were sold, and all of the balance emptied into sewers. The tax for emptying cesspools is 5 francs, or 96½ cents, per barrel containing 2 cubic meters of material.

This work cost the city as follows:

	Francs.	
Receipts	41,471.30 =	$8,003.97
Disbursements	45,188.70 =	8,721.41
Deficit	3,717.40 =	717.46

GARBAGE.

The collection and removal of garbage is performed by the city government (health department). The garbage consists of sweepings and general rubbish. Tenants collect it in boxes, and twice a week, early in the morning, set these on the sidewalk. The city wagons come around and collect it. In the suburbs, the finer stuff is retained by owners and made into manure to use on their grounds. The amount of rubbish thus collected during 1897 was 32,620 cubic meters (1,152,027 cubic feet). The coarser material, as glass, crockery, stones, etc., was dumped outside the city where filling material was especially needed. A great quantity of decayable matter was secured by gardeners.

Results.

	Francs.	
Receipts from all sources	114,147.45 =	$22,030.45
Disbursement	115,330.92 =	22,258.86
Deficit	1,183.47 =	228.40

The tax is 50 centimes (about 10 cents) annually per room, and is paid by the tenants.

The disposal of this vast amount of rubbish has become a serious question, as the promiscuous dumping of the same is becoming a great nuisance and gives rise to many protests. The city council has studied the question for some time, and last year sent a commission to the great centers of European population, to study the methods employed by others in disposing of garbage.

After traveling all over Europe, the committee returned and recommended as the most practical the Lee system of cremation, which in its main features is the same as the Fryer system, which has been adopted by the larger cities of England. The city council, through its health department, is now taking steps to carry out the commission's recommendation, and in the near future, all the garbage not otherwise needed will be cremated.

The cost of sweeping the streets and carrying away the rubbish for 1896 was 98,130.50 francs ($18,939.19), or 75 centimes (about 15 cents) per capita of population. The streets are mostly macadamized, only few being paved, and the coarse sweepings, stones, and earth, are used as filling material on streets, while the rubbish or decayable matter is disposed of like other garbage. Market and abattoir refuse is treated in like manner.

Dead animals, condemned meats, etc., are gathered up by the city wagons and buried on city lands set apart for that purpose outside of the city, and, when practical, at owner's expense. The deficit in that line in 1896 was 1,300 francs, or $250.90, which, however, is refunded by the Cantonal government.

The following statement will show the receipts, disbursements, and deficit in connection with the gathering and disposing of human excrement for 1896: Population along lines of sewerage system, 131,800; outside lines of sewerage system, 16,200; total, 148,000. Tanks in use along line of sewerage, 99,300; cesspools outside line of sewerage, 32,500; total product from above sources, 74,000 cubic meters (2,613,428 cubic feet). Made into fertilizer inside sewer system, 7,200 cubic meters (254,280 cubic feet); made into fertilizer outside sewer system, 8,100 cubic meters (286,064 cubic feet); total, 15,300 cubic meters (540,344 cubic feet). Collected by city wagons in tanks, 6,474 cubic meters (228,640 cubic feet) solid matter; collected from cesspools, 9,050 cubic meters (319,615 cubic feet) liquid manure.

RECAPITULATION.	Cubic meters	Cubic feet.
Tank contents	6,474 =	228,640
Liquid manure sold	295 =	10,418
Liquid manure given away	1,200 =	42,380
Liquid manure emptied into sewers	7,555 =	266,817
Liquid manure used on city lands	15,300 =	540,344
Liquid manure uncollected and allowed to run into public streams.	43,176 =	1,524,830
Total	74,000 =	2,613,429

SEWERS.

At the close of 1897, Zurich had about 93 miles of sewers. The main sewer is built of cement pipes, and connections are made of earthen conduits. All the household waste waters from kitchen, laundry, chambers, and water-closets are drained into the main sewer, where there is connection therewith; otherwise, into cesspools. Each house has separate drainage.

The sewer system does not as yet extend to all parts of the city, but new sewers are being added to the system from year to year (4,398 miles having been built in 1897), and new houses must have connection.

Only liquid matter is allowed to be drained into sewers (the solid substances being disposed of in the manner described), and these empty into the river Limmat below the city limits.

Surface or rain water in the principal portion of the city is drained through separate storm conduits into the rivers Limmat and Sihl, which traverse the city from south to north and northwest to north, respectively, to the junction of the Sihl with the Limmat.

No disinfection or deodorization of sewerage matter is resorted to, the river, being swift, wide, and deep, carrying it all off without necessity of chemical treatment.

Zurich being well drained by its two streams, and sanitary regulations being strictly enforced, the health of the inhabitants is good. Rubbish is not allowed to accumulate in streets or yards or anywhere within the city limits.

The sewerage system was started in this city in 1867, and extended from year to year. The cost of the entire system can be given only approximately, as figures from some of the annexed districts are unobtainable; but the city engineer estimates the cost at 12,000,000 francs, or $2,316,000.

A. LIEBERKNECHT, *Consul.*

ZURICH, *March 25, 1898.*

UNITED KINGDOM.

BRADFORD.

The population by the census of 1891 was 216,361; present population is estimated at 231,260. The area is 10,776 acres; ratable value, £1,130,375 ($5,369,574.43).

The refuse of the town consists, first, of street sweepings, which are collected by corporation horses, carts, and workmen, and are taken to certain store yards, whence farmers are allowed to cart them away free of charge. The annual cost of collection is £9,500 ($46,231.75). Second, ash-pit refuse, consisting of domestic refuse, cinders, ashes, vegetable refuse, broken pots, pans, etc. Hitherto, the collection of this refuse has been done by contract, the annual cost of collection being £8,530 ($41,511.24). The city council recently decided to collect this class of refuse by its own workmen. The existing scavenging contract will terminate in July next. The refuse is dealt with in large furnaces known as "destructors," which are placed in various parts of the city. There are four destructor depots, comprising, respectively, 12, 9, 8, and 6 cells. Some of these have been in operation sixteen years. The largest destructor has recently been replaced by two 6-cell destructors, "Horsfall's system."

Tests have been recently made with the following results:

Tests of the "Horsefall" destructor, Bradford installation, October 18 to 23, 1897.

Number of cells, 6.
Type of cells, back to back.
Duration of test, 141 hours.
Nature of fuel, unscreened midden and market refuse.
Men employed, including boiler attendant, 7.
Wages per day, 4s. 8d. ($1.13).
Total quantity of refuse burned, 721,280 pounds (322 tons).
Total quantity of refuse burned per cell per 24 hours, 20,462 pounds (9.13 tons); since increased to 10 tons.
Total quantity of refuse burned per hour, 852.6 pounds.
Total weight of water evaporated, 523,000 pounds.
Total weight of water evaporated per hour, 3,709 pounds.
Total weight of water evaporated per cell per hour, 618 pounds.
Water evaporated per pound of refuse burned, .725 pound.
Weight of clinker produced, 205,460 pounds (91.72 tons).
Weight of fine ash produced, 13,401 pounds (6 tons).
Total weight of residuals, 218,861 pounds (97.723 tons).
Percentage of residuals, 30.3.
Steam pressure maintained (by recorder), 60 pounds.
Temperature of feed water, 50° F.
Temperature of gases in main flue, 1,800° F.
Temperature of gases at chimney bottom, 900° F.
Average air pressure (water gauge), three-eighths inch.
Total I. H. P. per hour at 20 pounds, 185.45.
Total I. H. P. per cell continuously, 30.91.
I. H. P. hours per ton burned, 81.

At the same time, a test was made to find the amount of steam used by the patent steam jets, with the following results:

Duration of test, 6 hours.
Total weight of water evaporated, 14,000 pounds.
Total weight of water evaporated per hour, 2,333.3 pounds.
Total weight of water evaporated per cell, 388.8 pounds.

Summary of weights of refuse taken during test.

	Tons.	Cwt.	Qrs.
Left in pit to start with	14	0	0
328 loads of ash-pit refuse	290	5	0
22 loads of market refuse	16	18	0
3 loads of trade refuse		15	2
122 tradesmen's carts, averaging 2 cwt. each	12	4	0
	334	2	2
Less quantity left in pit	12	2	2
	322	0	0
Average weight of 1 load of night soil		17	3
Average weight of 1 load of market refuse		15	1

During the test, the power generated was utilized in the following manner: 101 tons and 5 hundredweight and 2 quarters of mortar were made and sold, value £26 16s. 6½d. ($130.54); 27 tons crushed clinker, value 18s. ($4.38), made and sold; 3 tons and 14 hundredweight fish guano manufactured; 6 tons of old tins, etc., sold.

GENERAL REMARKS.

The whole of the water evaporated was measured through a Kennedy water meter fixed direct to the boiler. It should also be distinctly understood that this test is a true record of a complete week's work, starting at midnight on Sunday, with the fires as they had been left on the previous Saturday, and 20 pounds pressure of steam, and working through until 9 p. m. on the following Saturday, and leaving fires banked and boiler tubes cleaned, ready to resume on the Sunday night following. One ton of coke was used during the first four hours to raise steam, after which the fire was allowed to die out. The price of coke was 2s. 6d. (60 cents) per ton.

It will be seen from the temperature of the hot gases escaping to the chimney that the boiler capacity is insufficient. Every destructor is fitted up with forced draft in the shape of two steam jets under each set of six cells. The refuse is reduced by burning to one-third in weight and one-fourth in bulk, the residue being in the form of clinker, which is utilized in making mortar, concrete, etc. The tins and pans are sold to a firm of chemical manufacturers at Hunslet, and are used for making a precipitant employed in the extraction of copper after the process of copper smelting. The fish garbage is placed in steam jacketed pans and made into manure in a powdered state. This operation is carried on by a contractor, who pays about £70 ($340.65) per annum for the privilege, including the supply of steam. At present, the vegetable refuse is burned in the destructor. The heat from the destructors is utilized in generating steam, which is used for the following purposes: Providing steam for forced draft, driving mortar mills, crushing and screening clinkers, disinfecting purposes, making fish refuse into manure, and lighting destructor works with electricity.

The cost of labor in burning the refuse is 6d. (12 cents) per ton. The blood collected at the public abattoirs is sold to contractors, who convert it into blood manure and also into albumen, which is used for dyeing purposes. The carcasses of dead animals and diseased meat are cremated at the destructors.

PARTICULARS AS TO SEWERAGE.

Bradford is situated in a valley which extends from the moorlands above Thornton to the wider valley of Airedale, into which it merges at Shipley.

The method of sewerage adopted in Bradford is known as the combined system—sewage and rainfall flowing into the same sewer. It was designed by Mr. Charles Gott, M. Inst. C. E.

The altitude of the borough varies from 240 feet above ordinance datum to over 900 feet; consequently, the inclinations of the sewers are generally very good, and sewer flushing is only necessary in a few districts where the inclinations are somewhat flat. In these cases, flushing tanks, with capacities varying from 700 to 2,300 gallons, have been constructed, and Field's patent flushing siphons have been adopted.

The subsoil in the Bradford district is mostly clay, and there is very little subsoil water. The sewers are generally constructed either of glazed earthenware pipes, with cement joints, or of brickwork, plastic-made red bricks being used except for the inverts of the larger sewers, when Staffordshire blue bricks are used. The mortar is made from Barrow blue lias lime (hydraulic) and engine ashes in the proportion of 1 of lime and 2 of clinkers, ground together in a mortar mill. In special cases, Portland cement is used in place of lias lime.

All the sewers are ventilated at intervals of 100 yards from the crown of the sewer to the street surface, by means of shafts formed of 9-inch glazed earthenware pipes, surmounted by an iron frame and grate. In about ten cases, connections have been made between main sewers and boiler furnaces, where mill owners would allow it. These have been fairly successful, but as the cold air rushes into the sewer at so many inlets, the ventilation is limited to the first 200 yards of the sewer nearest the furnace. The ventilation from the sewer to the street surface has been very successful. The total length of public sewers constructed by the corporation since the commencement of the work, in 1862, is 96 miles, at a cost of £282,300 ($1,373,812.95).

At the present time the number of laborers employed in the main sewerage department is about 40, besides 4 bricklayers, 3 timbermen, and 4 gangers.

The wages per week paid are as follows: Bricklayers, 35s. ($8.30); gangers, 32s. ($7.70); timbermen, 25s. ($5.80); laborers, bottom men, 24s. ($5.60); laborers, surface men, 22s. ($5.20). The hours worked are 49½ per week, and wages are paid for Christmas Day and Good Friday, which are kept as holidays.

HOUSE DRAINAGE.

About 45,000 houses have been connected to the new sewers since 1862. Each house is required to have separate drainage to the main sewer. All sink pipes, bath, and lavatory wastes are required to discharge into gulleys or disconnecting traps. House drainage is carried out by property owners under the supervision of inspectors under the sanitary authorities, but all public main sewers are constructed by workmen employed by the corporation.

The death rate previous to the construction of the new sewerage system was frequently over 30 per 1,000; the average for the last ten years, 18.81.

Rate of mortality for the last thirty-four years.

Year.	Estimated population in the middle of each year.	Births.	Deaths.	Annual rate per 1,000 living.	
				Births.	Deaths.
1864	118 008	4, 697	3, 615	39. 8	30. 6
1865	122, 058	4. 738	3, 292	38. 8	27. 0
1866	126, 018	4, 710	3. 434	37. 4	27. 3
1867	129. 978	4. 904	3. 182	37. 7	24. 5
1868 *a*	133, 938	4. 984	3, 566	38. 2	26. 6
1869	137, 898	5, 226	3. 536	37. 9	25. 6
1870	141, 858	5. 615	3. 927	39. 6	27. 7
1871	146, 987	5. 582	3. 754	38. 0	25. 5
1872	151. 770	6. 002	3. 962	39. 4	25. 7
1873 *a*	156, 609	6. 253	3 827	38. 6	24. 4
1874	163, 056	6, 528	4, 395	40. 0	27. 0
1875	168, 305	6. 556	4, 556	39. 0	27. 1
1876	173, 723	6, 787	4. 141	39. 2	23. 9
1877	179. 315	6. 797	3, 921	38. 0	21. 9
1878	185. 088	6, 602	4, 144	35. 8	22. 5
1879	191, 046	6. 358	4. 106	32. 7	21. 1
1880	197, 046	6, 363	4. 107	32. 3	20. 9
1881	184, 037	6. 058	3, 612	33. 0	19. 6
1882	200. 158	6, 225	4, 142	31. 8	21. 3
1883 *a*	204. 807	5. 953	3, 741	29. 1	18. 3
1884	209, 564	6 216	4, 255	29. 1	20. 0
1885	214, 431	6 218	3. 791	28. 98	17. 6
1886	219, 411	6 285	4, 187	28. 64	19. 08
1887	224. 507	6. 202	4, 458	27. 62	19. 86
1888	229, 721	6, 266	3, 922	27. 27	17. 15
1889	235. 056	6, 272	4, 492	26. 69	19. 11
1890 *a*	240 515	6, 247	4. 982	25. 97	20. 14
1891	216. 938	6, 214	4. 800	28. 64	21. 98
1892	219, 262	5, 959	3. 927	27. 18	17. 91
1893	221. 610	6, 112	4, 632	27. 58	20. 90
1894	223 985	5, 960	3, 797	26. 60	16 95
1895	226, 384	5, 894	4. 483	26. 03	19. 80
1896 *a*	228, 809	5, 945	3, 838	25. 94	16 77
1897	231 260	5, 678	4. 023	24. 55	17. 39

a In these years the births and deaths are those registered in fifty-three weeks.

SEWAGE DISPOSAL.

The sewage is conveyed by gravitation to the outfall at the sewage works, which are situated in the valley between Manningham and Frizinghall, about 2 miles from the center of the town.

The present works were constructed in 1873, and the process adopted is that of precipitation by lime and filtration through coke breeze. The precipitation tanks are 34 in number, with a capacity of 17,000 gallons. There are 34 coke filters, and each filter has an area of 40 square yards. The works are not at all commensurate with the requirements of the town at the present time, and the corporation has recently obtained authority to construct new works on a much larger scale, and it is also endeavoring to find a chemical reagent more suitable than lime for the peculiar sewage of Bradford. Persulphate of iron has been tried, and up to the present has given the best results. Wool washing and combing forms an important branch of the local industry, and the large quantities of grease discharged into the public sewers from wool-combing establishments cause the sewage to be very difficult to treat. The town council is now considering whether the wool combers should be required to deal with their own trade sewage and extract or recover the grease at their own works. The discharge into sewers of trade sewage which would interfere with the treatment of domestic sewage at the disposal works is prohibited under a local act of Parliament.

The corporation has purchased additional land as a site for the new works, which when added to the present works will give a total area of about 40 acres, one-half of which will be appropriated for precipitation tanks, buildings, etc., and the other half for artificial filter beds, either of sand, coke breeze, or similar materials.

The normal dry-weather flow of sewage is 10,000,000 gallons per day, and it is intended to provide 12 large tanks to be worked on the continuous system, each tank to be 300 feet long by 60 feet wide, with a total capacity of 8,000,000 gallons, or 80 per cent of the dry-weather flow. Seventy per cent of the whole volume of sewage flows to the outfall during the twelve hours between 8 a. m. and 8 p. m. Of the 10,000,000 gallons comprising the daily flow of sewage, about 5,000,000 consists of trade sewage from dye works, wool-washing establishments, etc., and 5,000,000, domestic sewage. The sewage throughout the whole of the twenty-four hours is found to be distinctly alkaline.

ERASTUS S. DAY, *Consul.*

BRADFORD, *June 28, 1898.*

BRISTOL.

Bristol is a city of 320,000 inhabitants. The garbage collected consists of ashes and the ordinary house refuse. The average collection amounts to 67,500 cart loads annually, at a cost to the city of about $45,000. The city does this work itself, and no contractors are employed. The garbage is burned in a destructor, at an approximate cost of 24 cents per ton. The cost of the destructor in 1897 was $23,500, including repairs. It belongs to and is worked by the city. It has not been long in use, and it superseded the old method of dumping refuse into excavations in waste ground. The only products of the destructor are clinker and ash. The clinker is found useful for ship's ballast, and combined with cement, for artificial stone. The ashes are ground with lime for mortar.

There is no sale for coarse rubbish, such as bottles, floor sweepings, etc., except tin cans, and these are almost unsalable, and bring little to the city.

All excrementitious matter is water-carried in Bristol, and is discharged untreated into a tidal river. The combined sewage system is used; there are no pumps.

The city cleans its own streets (paved with wood, granite blocks, and macadamized) with horse machines and manual labor, at an annual cost of $70,000.

The factories of Bristol, having access to a tidal river, discharge their waste therein.

The markets are owned and their refuse is removed by the city. Slaughterhouses are private, and their refuse is removed by their owners.

Dead animals are removed at owner's expense and sold to private firms, who in turn sell the products to different people. If the cause of death will permit it, the carcass may find its way to the Zoological Gardens for feeding the animals.

Meat and fish seized and condemned in the markets is occasionally sent to the destructor.

It will be seen from the above answers to the questions of the Department that the local conditions, in respect of a tidal river with a great rise and fall, are such that elaborate modern methods of sewage disposal have not been necessary.

LORIN A. LATHROP, *Consul.*

BRISTOL, *June 4, 1898.*

CORK.

The sewage of Cork and Queenstown is run into the sea. None of it is used for agricultural purposes. Street sweepings, horse manure, and other rubbish is taken at the expense of the corporation and dumped into pits in the country, where anyone may make use of it as he pleases. Anyone is allowed to gather horse manure, etc., off the streets. Household waste waters are drained into the sea. The water system of drainage is in use in both cities. The separate system of drainage is also in use, each group of houses having a principal sewer of its own. The waste of a factory may be collected within its own property or thrown into the public pits before mentioned. The official regulations do not allow such wastes to be dumped in public places or over quays, etc. Dead animals are removed by their owners, and the law does not allow them to remain in any place where they may interfere with public health, and they must not be thrown into the river. There is no scientific method resorted to for converting any of the garbage into fuel, or for utilizing it in any agricultural way.

DANIEL SWINEY, *Consul.*

QUEENSTOWN, *March 3, 1898.*

DUBLIN.

The corporation of which the officials of the Dublin municipality have control has a population of 245,001, according to the official census of 1891.

The corporation collects the sweepings and refuse of every kind from the streets, and the solid refuse from private dwellings within the city. The refuse is included under the general heads of scavenge from streets, ash pits and dust bins, and manure. I inclose the reports of the cleansing department for 1894, 1895, and 1896, which will give detailed account of the work of this department.[1]

The amount of material collected and the system of collection, which is by carts, is set out in the reports referred to. The work is carried out by the city government, and the total expenditure in this department is put down for the year 1896 at £42,831 14s 7d, or, in round figures, $207,000.

Manures are sold for fertilizers, in so far as markets can be found. Nonexcrementitious matter collected from the streets is used for filling up low places. Excrementitious matter from the streets, the collections from the ash pits and dust bins are mainly disposed of by being loaded on a barge and dumped in the deep sea.

The city has an elaborate system of collection of waste matter from private houses. In order to discourage the use of ash pits, etc., the corporation requires each householder to provide a zinc refuse bucket, in which are placed the ashes and other solid refuse which can not be carried off through the sewage pipes. These buckets are collected by the corporation, and emptied free of charge to the occupiers. There is no separation of tin cans, bottles, etc., from the other waste, and no attempt is made at utilization of any of the materials collected.

Household waste, etc., of a liquid character, is carried away through the sewers. Every house in the corporation must have one or more water-closets connected with the municipal system of sewers.

Excrementitious matter, dead animals, old clothes, and articles likely to breed contagion are collected by the corporation servants and burned in a destructor. No profit is derived from any refuse.

All the sewage is emptied into the Liffey or Dublin Bay, and is carried out by the tides. This is the present method, but the corporation has under process of construction an elaborate system (estimated to cost £300,000 or $1,500,000), by which, when complete, solids will be separated from liquids, and the latter clarified and sent out to the deep sea. The solids will be pressed and deodorized and made available for fertilizers.

Factories are required to dispose of their own refuse. All liquid wastes are permitted to be carried off through the sewers, except liquids containing greasy matter, which must be otherwise disposed of, or treated chemically.

The refuse of abattoirs and markets is collected by the corporation, mixed with the manure and refuse from the corporation stables, and sold as fertilizers. There are many private slaughtering houses throughout the city, as well as dairy yards, etc. The owners of these have to take care and dispose of their refuse, and the city exercises as careful an inspection over them as possible.

Dead animals are collected at the cost of the corporation and burned in the destructor, and no profit arises to the city from this source.

---

[1] Transmitted to Department of Agriculture.

The system in vogue in the suburbs and outlying townships of Dublin is much the same as in Dublin proper. In the smaller towns of Ireland, each householder disposes of the waste at his own cost.

NEWTON B. ASHBY, *Consul.*

DUBLIN, *March 29, 1898.*

DUNDEE.

Replying to the circular of January 20 last, I have to report that there is no peculiar feature in the disposal of the sewage of this city. With the exception of a few dry closets (which, however, are being abolished) the whole drainage is carried by sewers into the river Tay, whence it is carried out to sea by the tide, which has a rise and fall of 12 to 14 feet. Street sweepings and offal of all kinds are collected at depots in the outskirts of the town and sold for manure, if suitable for that purpose. Rubbish which can not be utilized, such as ashes, tin cans, etc., is thrown into a dump pile in connection with extensive works now going on at the harbor in reclaiming land from the river.

The corporation itself undertakes the collection and disposal of the city refuse, and the whole return it obtains from this work is the trifling sum received from the sale of the manure, which brings only about 18 cents a ton.

Destructors for burning useless waste material are in use in different parts of the country, but Dundee has not, up to the present time, found it necessary to adopt this method.

The population of the city is estimated at close upon 165,000.

JOHN C. HIGGINS, *Consul.*

DUNDEE, *May 17, 1898.*

DUNFERMLINE.

I have to say, in reply to Department circular dated January 20, 1898, calling for information on the subject of the disposal of garbage, sewage, etc., that the cities within this consulate are small and the matter is not treated by modern scientific methods, or in a way that would be of special interest to the Department.

J. N. MCCUNN, *Consul.*

DUNFERMLINE, *March 21, 1898.*

FALMOUTH.

This city has a population of about 13,000.

GARBAGE.

The material, in addition to the waste of animal and vegetable foods, contains the usual general house refuse, ashes, etc. About 1,600 to

1,800 tons are collected annually by the corporation carts, which go about daily. It is carted beyond the precincts of the town to agricultural land. This work costs about £350 ($1,700) per year. The material is handed over to farmers for manure. There is no further cost to the corporation in connection therewith. This method has been employed for the last thirty years.

Tin cans, broken crockery, ashes, floor sweepings, and other coarse rubbish are included with the garbage.

SEWERAGE.

All of the house drains are connected with the main sewers, and waste waters, etc., are disposed of in one sewer system.

The sewage, amounting to some 200,000 gallons annually, is conveyed to precipitation tanks and treated by chemical process. The affluent, after being strained, is discharged into the harbor below low-water mark, while the sludge is removed by night by the use of a hopper barge and discharged into the open sea in deep water. The combined sewer system is only partially used, viz, for carrying off surface water from the streets. No pumps are used, all being done by gravitation. No sewage is conveyed on the land. There are no filter beds.

STREET SWEEPINGS, ETC.

The corporation scavengers are daily employed in keeping the streets swept. The refuse is collected and put with the garbage.

There are no factories here.

Dead animals are buried by the owners after being skinned. Of course, in cases of disease, skinning is not resorted to.

HOWARD FOX, *Consul.*

FALMOUTH, *March 31, 1898.*

GLASGOW.

STAFF.

In May, 1868, the Glasgow police commissioners appointed for the first time an inspector of cleansing, whose duty it was to attend to the collection, removal, and disposal of the city refuse, as well as to the sweeping and watering of the streets and roads within the city. Briefly stated, the terms of his appointment bore that he was to be responsible to the commissioners for the proper state of cleanliness of the public streets, private streets, and courts within the city, for the regular collection, removal, and disposal of the city manure, for the keeping of books and accounts connected therewith, for the good conduct of the scavengers and other persons appointed by him, and generally for the complete state of efficiency of his department. The department has increased with the growth of the city, until from the 738 men employed twenty-eight years ago, the staff has expanded to 1,113, that being the average number employed during the year ending May 31, 1896. The staff is distributed over the thirteen districts into which, for cleansing purposes, the city is divided, and comprises day and night sections. In the former the employees number 538, and in the latter 575.

STREET SWEEPING AND WATERING.

The sweeping of the paved streets of the city is done during the night, chiefly by rotary horse brushes. Of these, there are 33 in use. They start at 10 p. m. and work, as a rule, till 9.30 a. m., with one and one-half hours off for meals; but at times they stop earlier, according to the state of the weather. In that event, the horses and men are employed at other work. The machines are accompanied by sweepers, who gather the sweepings into heaps, and are followed an hour later, viz, at 11 p. m., by carts which remove the sweepings. All the principal streets are thus swept nightly, second-rate streets every alternate night, and those of less importance at intervals, according to their requirements. The principal streets are also "picked" during the day, and the "pickings" deposited in bins sunk into the pavements in the principal parts of the city and the main arteries of traffic leading to the suburbs. These bins, numbering 1,382, are emptied during the night and their contents removed, along with the material which has been swept to the side of the roadway by the machines. The sweepings so collected, being chiefly composed of horse droppings, are mixed with the contents of ash pits, etc., in the dispatch works, and sold as city manure.

The macadamized roads are attended to by the day staff, the mud being either deposited in convenient tips or trucked to the country, where it serves to fill up hollow ground. It should be clearly understood that no portion of the detritus from these roads is sold as manure, being valueless as such.

Snowfalls tax the resources of the department to the utmost. On such occasions, all the available staff is set to work with the object of having the streets cleared as rapidly as possible. If the fall is light, it is dealt with night and day by the scavenging staff, i. e., the sweeping machines and sweepers, with the necessary carts. Horses and carts are also hired to assist in the removal of the snow, a standing contract being entered into with a contractor in each district of the city for this and other purposes. During such light falls, the collection and removal of domestic refuse go on as usual; but to deal promptly with a heavy fall every available man and horse is set to work, everything else that can stand being neglected. Road scrapers, drawn by horses, are also used in this connection. The river Clyde provides an easy and convenient tip for clean snow, and it sometimes receives great quantities. The river Kelvin also provides an outlet for the western and northwestern districts, while tips are found in other localities on pieces of vacant ground. When the snow has melted, the residuum is carted away.

Private streets and courts, which prior to 1866 were attended to by the owners, have since that year been swept by the staff of the cleansing department, the cost being met by a special rate of one penny per pound, payable by the proprietors. In this portion of the work, 224 men and 15 overseers are engaged. Every court which is to be attended to is visited and swept once, and in many cases twice and thrice daily, as necessity requires. With very few exceptions, all the back yards in the city which are common to more than one tenant are thus attended to, the exceptions being isolated cases where proprietors decline to pay the assessment. The dirtier courts are regularly hose washed, for which purpose they were, some years ago, fitted with taps at the expense of the commissioners. Of these taps there are 1,772. During the summer months, these courts and privies are in many instances hose washed daily, and at other seasons weekly or oftener, according to the periods when the ash pits are emptied.

The watering of the streets is undertaken by means of 48 ordinary water barrels, containing 330 gallons; 3 iron tanks, 2 of 456 gallons and 1 of 345 gallons capacity, and 9 Willacy's patent revolving-disk watering machines, 8 having a capacity of 300 gallons and 1 of 375 gallons. The ordinary barrels are used in the busier streets, and it takes two and in some cases three runs to cover the full breadth of the street, while the Willacy machine covers at one run a road 40 feet wide. These latter machines are best suited for the quieter streets and macadamized roads on the outskirts of the city, and, although more costly to keep up, get over the ground much more rapidly.

Watering is also resorted to during the night, for the purpose of preventing dust rising from the operations of the sweeping machines; as also when the streets are in such a pasty condition as to render machine sweeping difficult. A plentiful supply of water is obtained from the fire plugs throughout the city.

COLLECTION AND REMOVAL OF REFUSE.

This portion of the work may be divided into four sections, viz: (1) Domestic or household refuse; (2) refuse from business premises, such as shops, warehouses, and offices; (3) excremental matter from public works and dwelling houses, and (4) stable manure and refuse from abattoirs. Domestic refuse is collected in ashpits situated in the rear of tenement dwellings all over the city, and these are emptied weekly, with the exception of the central district, where the pits are attended to twice weekly. To facilitate and insure systematic emptying, each district is subdivided into six divisions, one of which is worked each night. The men who empty the ashpits are termed "wheelers." They start work at 10 p. m., and are followed an hour later by the carts. They work, as a rule, in sets of two or three, each set being furnished with a carrying creel and a barrow fitted with india-rubber tire on wheel. The men wear rubber shoes. The barrow is, of course, used for level places and the creel where the refuse has to be carried up or down stairs. These men are paid by the ton, at rates varying from 7⅝d. to 11d. (15 to 22 cents). While the ashpit system obtains generally, a daily morning dust-cart service is in operation in a portion of the west end of the city, where the houses are of the better class.

Refuse from offices, shops, warehouses, and other business premises in the central or business portion of the city is removed daily by the morning dust-cart service. In connection with this service and for the convenience of occupiers of such premises, the department supplies covered galvanized buckets, of regulation pattern, at cost price. These buckets not only prevent the light material from being blown about, but are more easily emptied and look better than the nondescript receptacles occasionally used. The superintendent of cleansing can insist on suitable buckets being used, and he seldom meets with serious objections in this connection. The refuse collected by this service is removed in covered carts with crank axles, so as to facilitate emptying the buckets into them. They are considerably larger than the ordinary cart, the material being comparatively light. This portion of the city refuse is, as a rule, cremated, nothing of manurial value being in it. Recently, a system of removal of fish refuse in pails with air-tight covers, such as are used for excrementitious matter, was introduced. This valuable material is thus removed without becoming a nuisance, and instead of being burned is mixed and sold with the city manure.

The excrementitious matter which does not find its way into the sewers is collected in galvanized pails of regulation pattern, these being removed and replaced by clean ones as often as necessary. Owing to the extension of the water-closet system, at the instance of the sanitary department, these pan closets are being gradually abolished, but there are still in connection with dwelling houses 2,538, and with public works 3,526; in all, 5,064 pails. The vehicles used for the removal of the pails are four-wheeled covered vans. Each van is constructed to contain thirty pails. These vans pass along the streets without the slightest effluvium being perceptible. On reaching the dispatch station the pails are uncovered one by one, emptied into a tank constructed specially for the reception of the excreta, and after being washed in hot water and disinfected are replaced in the van, which also undergoes the same process of treatment.

The removal and disposal of the stable manure and the refuse from the abattoirs of the city form no little item in the work of the department. In addition to the manure produced at the stables of the department, all the manure from the corporation tramways department, as well as that from sundry other stables, is dealt with. The refuse from the abattoirs is also mixed with the stable manure, and goes to improve its quality. For this material, which amounts to about 46,000 tons per annum, a ready sale is found, and the department derives a considerable income therefrom.

In addition to what may be termed the ordinary refuse, the department undertakes the disposal of the sludge resulting from the operations of the sewage purification department, the annual output of which runs to about 13,753 tons. Of this, 4,846 tons were mixed with city manure last year, the remainder going direct to the tips.

The refuse of the adjoining burghs of Partick and Kinning Park is also, by arrangement, sent to the Kelvinhaugh and Crawford street dispatch works for treatment and disposal. The quantity derived from these sources in twelve months amounted to 14,234 tons.

TREATMENT AND MANIPULATION OF REFUSE.

For many years after the collection and removal of the city manure was undertaken by the authorities, places of deposits for the material were owned or rented at various points around the city. In those depots there were stored at times many thousands of tons of refuse, and as some of them were not far distant from dwellings no small nuisance resulted, and complaints were loud and numerous. This primitive system would not be tolerated or permitted in this enlightened age, and it can not bear comparison with the more scientific methods now in operation. With the advance of sanitary science, more frequent and systematic removal of house refuse became necessary; consequently the refuse became lighter and more difficult to turn into a marketable commodity, and it was to meet this difficulty that mechanical means had to be adopted. The refuse dispatch works at which the waste material of the city is now dealt with are situated all round the city. These works were designed with the view of separating the inferior material from that of manurial value, reducing the bulk by the cremation of the former and the mixing of the latter so as to form a good fertilizer. Although the internal arrangement of the works is different, on account of the nature and dimensions of the ground upon which they stand, the same method is adopted at each. The process is as follows:

Carts with refuse from ashpits and bins, on arriving at the works, pass over a weighing machine, the weight and time of arrival being noted by the weigher. They then pass on to the tipping floor, which is of iron, supported by iron girders and causewayed. In this floor are various shoots to the flat beneath, for the different classes of material. The ashpit refuse finds its way through these into revolving screens, which work in a horizontal position. The finer portions of the refuse pass through the screen into a mixing machine, which also receives a regulated quantity of excrementitious matter from a tank conveniently situated, and a proportion of sweepings from paved streets. The whole is thoroughly mixed by means of revolving blades, and falls into railway wagons on the siding underneath. The product, which forms a manure free of all objectionable rubbish, finds a ready sale among agriculturists. The rougher portions of the material, which can not pass through the meshes, are forced by the revolving process out of the bell-shaped mouth of the screen on to an endless carrier. When passing along this carrier, any articles of value, such as iron, meat, tins, etc., are picked off and thrown aside, solder being extracted from the latter by means of specially adapted furnaces. The remainder, chiefly light, useless material, falls from the carrier on to a range of furnaces on a lower level. In this manner, all the useless refuse which formerly rendered the city manure next to unsalable is reduced to clinker, which is broken on the premises and sold at a fair price for concreting purposes.

During wet weather, an immense quantity of slushy sweepings is collected from the paved streets. In order to utilize this material (which is mostly composed of horse droppings) large tanks are supplied. These have sloping bottoms and are provided with means for draining off the water. Into these tanks cart loads of slops are thrown, and when full the tanks are allowed to stand for a day or two. The contents are then mixed with the prepared manure. Stable manure is dropped from the tipping floor direct into the wagons below, as is also mud from the macadamized roads and useless rubbish collected from the quays and wharves. The stable manure is of course sold, but the rubbish and mud are trucked to tips on the farms of the department at Fulwood Moss and Maryburgh on the Caledonian, and Ryding on the North British railways.

The works are started on the arrival of the first cart of refuse, and continue in operation until the last arrives, not later than 10 a. m., by which hour the whole night collection has been satisfactorily dealt with and dispatched to the country. The ventilation of the works is effected by means of powerful fans, the largest of which passes 40,000 cubic feet of air per minute. The fan exhausts from the mixing chamber and forces the vitiated air into pipes which lead into chambers underneath the cremating furnaces, thus forming a blast. The smoke, which is light in color, is carried off by means of chimneys from 250 to 300 feet in height.

Without these works, so admirably adapted for the treatment of all the various kinds of refuse, it would be impossible to conduct the cleansing operations with that degree of efficiency to which they have been brought.

DISPOSAL OF REFUSE.

The collection and treatment of the refuse of the city form no light task, but the disposal of such a huge quantity of material as 1,262 tons per day (which was the average for 1895-96) is a question which taxes to the utmost the staff of the department. No doubt, the process of cremation reduces the quantity of domestic and shop refuse consider-more complete railway connection to Maryburgh, as well as siding accommodation for the delivery of city manure to the farmers in the neighborhood.

WORKSHOPS.

In 1878, on the acquisition of ground at St. Rollox for dispatch works, the workshops of the department were transferred there from Parliamentary road. The works are upon the Caledonian Railway system, but by arrangement with the other companies, wagons requiring repairs are run directly into the shops. The workshops are fitted with labor-saving machinery of the most improved description, viz, steam hammer, fans, circular and band saws, turning lathe, planing, mortising, boring, and screwing machines. These machines are driven by a small engine, which is supplied with steam from the boiler at the adjacent dispatch works. There are employed in the workshops 8 cartwrights, 9 wagon builders, 2 joiners, 9 blacksmiths, and 3 painters. All the operations carried on in the workshops are under the direction of a practical foreman. The only section of the work done by contract is the horseshoeing. With the extension of the city, stables had to be placed in the various districts, and it was found to be more economical to hire a jobbing horseshoer in the vicinity than to send horses from all quarters of the city to a central forge.

GENERAL STORES AND FORAGE DEPARTMENT.

As already stated, the crops grown upon the farms of the department go a long way toward providing food and bedding for the stud. The hay crop is more than sufficient to meet all the requirements of the cleansing and several other of the corporation departments, while the oat crop furnishes straw which very nearly suffices for the bedding. The hay and straw are baled at the farms and trucked by rail to the city. At the granary the hay is mechanically chopped and sifted, and the grain, which is purchased monthly, is bruised, mixed, and distributed in regulated quantities to the various stables. For the year 1895–96, the cost of feeding and litter was at the rate of 10½d. (23 cents) per horse per week.

HOUSES FOR EMPLOYEES.

At each of the chief cleansing stations within the city, suitable houses are provided for the principal foremen. At Kelvinhaugh four tenements have been erected for the workers. These comprise six houses, of one apartment each, and rent at from £6 10s. to £7 10s. ($31.63 to $36.49), twenty, of two apartments, renting at £8 15s. to £9 15s. ($42.58 to $47.44), and two houses for foremen, containing four apartments, at £19 ($92.46).

OFFICE.

The chief office of the department is in the city chambers, and is connected by telephone with all the dispatch stations, stable yards, and muster halls, as well as with the exchange. The private connections number 14, and by means of them the foremen of the different districts can be instructed from time to time as to anything requiring their attention, and can also apply for advice or instructions. The office staff numbers 14, and is employed in arranging and recording, under different headings, the work done each day. The foremen of the different districts and dispatch works send in every morning the details of the work done during the previous night and day, and some idea of its extent and variety may be gained from the fact that a record of 24 hours' work covers eighty-five pages of foolscap. In addition to the summarizing and recording of the outdoor routine work, ledger and daybooks are kept for purchases under different assessments. The accounts of collections and payments for sales of manure to farmers, etc., number in all over 3,000; making up pay bills for 1,113 men, and directing traffic of 890 railway wagons used in the conveyance of manure and rubbish, also form part of the work, while the correspondence involves the dispatch of, on an average, 120 communications daily. Comparisons of revenue and expenditure are made up monthly, so that the progress of the finances in comparison with the estimates may be noted. The total amount dealt with in 1895–96 was £140,222 9s. 5d.

It will thus be seen that the cleansing of a large city, according to modern principles, is a gigantic and difficult undertaking. In Glasgow, it involves the employment of over 1,100 men and 262 horses; the regular cleansing of back courts and closes; the sweeping and watering of all streets and roads; the systematic removal, treatment, and disposal of the heterogeneous mass of refuse collected, amounting to 1,262 tons per working day; the maintenance of 890 railway wagons and other plant, and the control of five different farms, covering in all 680 acres.

The cost of these operations during the year ended May 31, 1896, was £64,546 ($314,113). This cost compares favorably with that of cleaning some of the principal English towns.

SAMUEL M. TAYLOR, *Consul.*

GLASGOW, *March 14, 1898.*

LIVERPOOL.

The population of Liverpool is estimated at 650,000.

GARBAGE.

In addition to the waste of animal and vegetable foods, the garbage collected consists chiefly of ashes and ordinary domestic refuse. The report of the medical officer of health states that in 1896, 282,296 tons of town refuse were disposed of by the various available means; but this total does not represent the quantity actually collected, for during the winter months a large proportion of the street sweepings consists of water, which is drained out before the refuse is further handled. The garbage is periodically collected by carts. The work is done by the corporation staff; the cost includes the cleansing of the public urinals, water-closets, water troughs, street watering, disinfecting, etc., and it is impossible to give, as a separate item, the cost of collecting and treating the garbage. The garbage and sewage are utilized for fertilizing purposes when there is a considerable portion of organic matter in the refuse, and to a limited extent it is used as fuel. The garbage is disposed of either by combustion in destructors or taken out to sea by hopper barges. The material which is cremated in destructors yields fine ash and clinker. The fine ash is sent to a "tip" or to the sea, and some of the clinker is broken fine and made into concrete slabs for footpaths. The production of steam from refuse combustion is equal to 40 I. H. P. per cell, when burning at the rate of 6 tons per cell per 24 hours. The plant is owned by the corporation, and the cost of burning in the destructors is not quite 25 cents per ton.

The refuse tin cans, bottles, waste paper, and other rubbish are not specially dealt with in Liverpool, although tin cans, etc., are sold at about 36 cents per ton, and old bottles at 2 cents per dozen.

SEWAGE.

The household waste from kitchens, laundries, chambers, etc., is dispatched through waste pipes over a properly trapped gully to the public sewer. In Liverpool, practically the whole of the excrementitious matter is "water carried," the greater portion to the tidal waters of the river Mersey and a small proportion to two separate sewage farms.

The combined sewage system is principally used here. In some districts of the city, the separate system is being introduced. Pumps are not used.

The system employed on the sewage farms consists of broad irrigation on cultivated land. This has been in operation for about twenty-five years. The crops grown are rye, grass, cabbages, potatoes, mangolds, and turnips. The cost of maintenance is nearly $27,000 per annum. The sewage is not treated. One of the farms and half of the other belong to the city. The land is underdrained. The area of the two farms is 392 acres. The portion of the entire population draining to these farms is 65,000, and the relation between the population of the district and the area of the irrigation fields in Liverpool is about 165 persons to the acre. Small filter beds are in use, but not for a sufficiently long time to enable results to be given. None of the sewage collected in Liverpool is treated with chemicals for precipitation of suspended and dissolved matter. The quantity of solid products from the city waste is inconsiderable. Under the public-health act of 1890 the temperature of waste water, steam, etc., from factories must not exceed 100° F., and no departure from these regulations is now permitted.

The abattoirs in Liverpool are the property of a private company. Sweepings from the markets are partly tipped for sale as manure and partly cremated.

Dead animals not fit for food are skinned; the hides are salted and tanned, and the carcasses, together with all other diseased or condemned meats, are put into a digester, the fat is removed and as a rule is sold to soap makers. The residue is passed through a machine set with knives to cut fine; it is then put into a fertilizer tank and burned, and afterwards mixed with soot and very fine soft coal ashes and sold as a fertilizer.

ST. HELENS.

St. Helens has a population of about 85,000.

GARBAGE.

The garbage collected consists, in addition to the waste of animals and vegetables, of paper and straw litter, wooden boxes, shop refuse, and some ashes. The amount collected is from 40 to 60 tons per day. The system of collection is by scavengers and dust carts, the work being done by the municipality. The cost of the collection and removal of garbage can not be given as an item separate from the cost of collection and removal of other refuse. The garbage is removed to a destructor owned by the corporation and is there destroyed by fire. Practically there is only one product, a very fine clinker, which is used by the corporation for bottoming roads.

Tin cans, bottles, broken glass, floor sweepings, and other coarse rubbish are also carried to the destructor and there burned.

SEWAGE.

Household waste water from kitchens, laundries, chambers, etc., is carried off by sewers, with which all the buildings in the municipality are connected.

As to the disposal of excrementitious matter not water-carried, the system in use is known as the tub-and-pail, full particulars of which can be found in accompanying Exhibit C.[1] Ashes are ground up with sewage from tubs, and the resultant finds a ready sale among farmers, by whom it is used as manure, and brings an annual income of about $5,000.

Storm-water sewers are in general use. The sewage falls by gravitation onto a field, where it is dealt with by the addition of lime. Iron salts from chemical products of the town (St. Helens being the leading chemical center of Great Britain) assist in precipitation. Five grains of lime per gallon are allowed for precipitation. After being in a state of quiescence for about four hours, the sewage flows off fairly clear into a brook. The dry-weather flow is about 2,500,000 gallons per day. No use is made of the sewage. The streets are swept and cleaned by the corporation, the sweepings being burned in the destructor. The cost of this item can not be given separately. The corporation employs its own road sweepers, drawn by horses; it also employs men with hand brooms.

---

[1] Sent to Department of Agriculture.

All the waste and by-products from factories are disposed of by the manufacturers themselves, being principally utilized in the manufacture of chemicals. Market and abattoir refuse and dead animals are treated the same as garbage.

I inclose official documents, marked Exhibits A, B, and C,[1] bearing upon the subject-matter of this report.

JAMES BOYLE, *Consul.*

LIVERPOOL, *April 19, 1898.*

LONDON.

Referring to Department circular dated January 20, 1898, I forward herewith the following official publications bearing on the disposal of garbage and refuse in London:

(1) Report of the street committee, which deals fully with the question of the disposal of refuse, street sweepings, etc., within the city boundaries. (2) Worth and Crimp, the assistant engineers of the London County council, on the main drainage of London. (3) Report of the London County council's chief engineer as to the treatment and disposal of London sewage during 1896. (4) Reports by the chemist of the London County council on the filtration of crude sewage and sewage effluent. (5) The public-health (London) act of 1891, together with by-laws made by the London County council thereunder. (6) Report by the council's medical officer of health, submitting summary of reports by Dr. Young on the collection and disposal of house refuse by London sanitary authorities. (7) Report on dust destructors, by the council's medical officer and engineer.[2]

The above documents contain information as to sewage, house refuse, earth closets, privies, cesspools, and receptacles for dung.

Manure from stables and other premises is generally disposed of by the owners to private firms, but the sanitary authorities have power to require its removal, or in special circumstances to remove it themselves.

Household waste waters from the kitchen, laundry, and chambers pass into the sewers, or in rare instances into cesspools.

Street sweepings are collected by the various local sanitary authorities, and I understand the usual practice is to convey them to places outside London, where they are sold for agricultural purposes.

---

[1] Sent to Department of Agriculture.

[2] The chief points of the first three publications are given at the end of this report. The other inclosures have been transmitted to the Department of Agriculture.

Factory wastes, solid or liquid, market and abattoir refuse, and dead animals are, it would appear, collected and dealt with by firms engaged in the manufacture of artificial manures or other trade processes.

WM. M. OSBORNE,
Consul-General.

LONDON, *May 31, 1898.*

THE MAIN DRAINAGE OF LONDON.

[Paper read before the Institution of Civil Engineers at its meeting on February 23, 1897, by John Edward Worth and William Santo Crimp, MM. Inst. C. E.]

The main drainage of London was last brought before the institution in a paper by the late Sir J. W. Bazalgette, past president, in March, 1865, and its past history may be briefly referred to here. Prior to 1847, the sewers of London had been managed by eight distinct public bodies; but in that year these were superseded by the commission of sewers, the members of which were nominated by the government. Within nine years of its formation, the commission was reconstituted no fewer than six times, lastly in 1855; and during the period referred to the question of main drainage was discussed in all its phases, but without practical result. In the drainage system in operation in 1854, the main sewers followed generally the valley lines and discharged their contents into the Thames at various points within the metropolitan area at about mean tide level. As the tide rose, it closed the outlets and dammed back the sewage flowing from the higher ground, which accumulated in the low-lying portions of the sewers and remained stagnant for several hours daily. The fact that a gigantic system was subsequently carried out at a cost of several millions sterling affords conclusive proof of the necessity which existed for dealing with the sewage upon comprehensive lines, and it is unnecessary to describe the state of the Thames within the metropolitan area further than to say that it was notoriously bad.

In 1856, a metropolitan board of works was constituted and formed the first authority elected under the system of local government, and by and for the purposes of the act which brought that body into existence, London was divided into 39 districts. Sir J. W. Bazalgette was appointed engineer to the board and was instructed to prepare plans for the interception from the Thames of the sewage of the metropolis. The objects sought to be attained by the proposed works, were the interception of the sewage as far as practicable by gravitation, together with so much of the rainfall as could be reasonably dealt with, and its conveyance to points some distance below the metropolitan area. In designing the works, Sir J. W. Bazalgette, who was assisted by Messrs. Bidder and Thomas Hawksley, past presidents, observed the principles of a constant flow in the sewers, the abolition of tide locking with its well-known disadvantages, and the provision of improved outfalls to enable the main drainage system to deal with the sewage of districts previously imperfectly drained. The system of sewers as designed and executed comprised on the north side of the Thames three large intercepting sewers, two of which, known as the high level and the middle level, are gravitation sewers from their commencement in the western and the northwestern parts of the metropolitan area to the outfall works at Barking, and a low-level sewer, which deals with the drainage area which is at too low a level to allow gravitation into the two intercepting sewers referred to.

These sewers may be briefly described as: (A) The high-level sewer, commencing with the junction of the Fleet sewer at the foot of Hampstead Hill and proceeding to Old Ford; (B) the middle-level sewer, constructed generally in the lowest portion of the gravitation area, commencing at Harrow Road and joining the high-level sewer at Old Ford; (C) the low-level sewer, which follows generally the north bank of the river.

There is an important exception to the general rule in the route of the low-level sewer by reason of the configuration of the Thames; for instead of following its tortuous course, the sewer passes in an easterly direction from Blackfriars Bridge to the Abbey Mills pumping station, the large area lying between it and the river below the point referred to being drained by a subsidiary sewer known as the Isle of Dogs branch.

At the point of junction of the high-level and middle-level sewers at Old Ford, there is a large storm-overflow chamber for the purpose of relieving the outfall sewers beyond from excessive volumes of storm water into the River Lea, because the two sewers continuing onward from Old Ford to the outfall works at Barking are of much smaller carrying capacity than the two sewers referred to. The two outfall sewers from Old Ford onward are constructed side by side at the same level, and are each 9 feet by 9 feet, constructed throughout in an embankment considerably above the level of the ground, and pass through the site of the Abbey Mills pumping station. At the latter place, the low-level intercepting sewer terminates, and the sewage is pumped into a third sewer of similar dimensions, the three sewers being then carried side by side to the Barking outfall works. In order to obviate the necessity of constructing this low-level sewer at a great depth and of raising all the sewage to a great height at Abbey Mills in one lift, a second pumping station, known as the Western, was built at Grosvenor road, Pimlico, for dealing with the districts west of that place. On arrival at the outfall at Barking, the sewage could be discharged either into the river direct or into a tidal reservoir of a capacity of 35,000,000 gallons and covering an area of 9½ acres, in order to admit of the sewage being discharged during ebb tide.

Western pumping station.—The western pumping station occupies about 4 acres of land, and contains four single-acting beam-engines, each of 90 horsepower, all placed in a rectangular building, with a pump well occupying the entire basement, divided into two compartments, one under each pair of engines. These compartments communicate with each other, but means are provided for separating them for cleansing or other purposes, and there is a separate inlet into each from the main sewer, so that each pair of engines can work independently. There are also movable screens in order to intercept any solid substances which might interfere with the action of the pumps. These screens are in duplicate and are lifted out for cleansing purposes when necessary. The engines are condensing rotative beam engines, constructed by Messrs. James Watt & Co.; there are two pumps to each engine, one on either side of the beam center. The steam cylinders are 3 feet 1 inch in diameter, with a stroke of 8 feet; the pumps have a diameter of 5 feet 3½ inches, with a stroke of 4 feet, and are of the single-acting plunger type. Steam is supplied by eight boilers, 6 feet 9 inches in diameter and 22 feet long, working at a pressure of 40 pounds per square inch. There are coal vaults and other accessories necessary for the proper working of the station. There is also a cold-water reservoir for condensing purposes situated in the grounds, capable of containing half a million gallons of water.

In order to provide for the contingency of a breakdown of the principal engines, an auxiliary engine was erected in a separate building at the rear of the principal buildings. It is a horizontal engine of 120 horsepower, supplied with steam from two boilers of the same dimensions as those in the main boiler house. It works two pumps, each 4 feet in diameter, placed in a separate well, and is provided with separate inlet and outlet channels distinct from those of the main pumping station. Buildings are provided for the accommodation of the staff, which consists of 18 men. The works were commenced in July, 1873, and the station was opened on the 5th of August, 1875. The cost was £183,739 ($894,165), of which sum £56,879 ($276,802) was for engines and pumping machinery. At this station the lift is 18 feet, and about 54,000,000 gallons can be pumped per day of twenty-four hours. The sewage at this pumping station is discharged into the head of the main low-level intercepting sewer, flowing in an easterly direction, as already described, to Abbey Mills.

Abbey Mills pumping station.—The Abbey Mills station is situated upon a site of 7 acres of ground, through which the northern outfall sewer passes at a height of about 17 feet above the surface of the ground. On the southwest side of the embankment stand the boiler and engine houses, chimney shafts, coal stores, and other accessories, while on the northwest side are the reservoirs for water for condensing purposes, and eight workmen's cottages. The engine and boiler houses form one building, the engine house being cruciform in plan. There are eight beam-engines, each of 142 horsepower, arranged in pairs, each arm of the structure containing one pair, parallel to one another. All the steam cylinders are at the inner end of each arm, so that the cylinders are arranged symmetrically around the center of the building, under the dome. The engines provided were condensing rotary beam. engines with cylinders 4 feet 6 inches in diameter and 9 feet stroke, the pumps being of the double-acting piston-type, each engine working two of a diameter of 3 feet 10½ inches, with a stroke of 4 feet 6 inches. The capacity of this station as designed was equal to 135,000,000 gallons per day, and the lift was 36 feet. Sixteen boilers were provided, 8 feet in diameter and 30 feet in length, at a working pressure of 30 pounds per square inch, in two batteries of eight, one battery being situated in the western and one in the eastern boiler house. Arrangements were made for straining the sewage before being pumped, as at the Western pumping station. The pumps deliver into cast-iron mains, 6 feet in diameter, running along the middle of three arms of the building, where, at the point of junction in the center of the engine house, an air vessel 10 feet in diameter was placed. The sewage was then passed along the middle of the fourth arm, into which the sewage from the pumps situated in that arm was also discharged, the whole being forced through a cast-iron rising main 10 feet 6 inches in diameter, which discharged into the northern high-level outfall, at this point enlarged by the construction of a third sewer of the same dimensions as the two others. The cold-water reservoirs at this station cover 1 acre and contain about 1,000,000 gallons. The works were formally opened on July 30, 1868, the cost of the buildings being £218,300 ($1,062,357), and that of the engines and other machinery about £61,000 ($296,856).

Soon after the opening of the station the air vessel, with that of a similar kind at the western pumping station, was destroyed, probably by the air space becoming filled by corks and other floating substances, and open-top standpipes were substituted. When the accident occurred, two additional discharge mains were constructed, so that in the event of an accident occurring to the rising main, some of the sewage could be pumped through these independent mains.

The northern outfall sewer frem Abbey Mills to Barking consists of three parallel lines of culverts, each 9 feet by 9 feet of horseshoe section, with a fall of 2 feet per mile, and is carried over the various rivers and railways by means of aqueducts of special construction. The invert level of the outfall sewers at Barking is 11 feet above ordnance datum, while the highest tide recorded in the Thames during recent years, at that part of the river, is about 17 feet above ordnance datum. The largest reservoir at the outfall before referred to was intended for the purpose of storing the sewage against the incoming tide, so as to enable the greater portion of it to be discharged on the ebb. The main outlet to the river, which is at about low-water level, consists of nine culverts, each 6 feet in diameter, and the works were provided with penstocks and sluices for the purpose. These works came into operation in August, 1864.

The works on the south side of the Thames were designed generally in accordance with the principles observed for those on the north side, but there is an important difference, inasmuch as all the sewage on the south side has to be pumped; therefore the main intercepting sewers on the south side may be regarded as low-level sewers. There are for the drainage of the districts west from Greenwich three main lines, namely, the Effra branch, commencing at Norwood, the southern high-level sewer, commencing at Balham, and the southern low-level sewer, commencing at Putney. The two sewers first mentioned are brought into the New Cross road near New Cross station, and they are carried along that road to Deptford. The southern low-level sewer is nearer the river and passes through Battersea, Lambeth, Walworth, and Deptford to the pumping station at Deptford Creek. At this point, its contents are pumped into the southern outfall sewer, into which the two first-mentioned main lines drain by gravitation.

Deptford pumping station.—The Deptford station, which is built at the side of Deptford Creek, covers an area of 3 acres, and was completed in May, 1864. It was erected at a cost of £109,455 ($532,663) and contains four beam engines, each of 125 horsepower, the total cost of which was £28,993 ($141,094). These were condensing rotative beam engines, capable of pumping about 123,000,000 gallons daily. The steam cylinders are 4 feet in diameter, with a stroke of 9 feet, and the pumps, two of which are worked by each engine, are of the single-acting plunger type, the diameter of the rams being 7 feet and the stroke 4 feet 6 inches. Steam was originally supplied by ten Cornish boilers, each 30 feet long and 6 feet in diameter, the working pressures being 40 pounds to the square inch. The lift of the pumps is about 18 feet. Thirty-three men are employed at this station.

Crossness pumping station.—From the Deptford pumping station all the sewage flows to Crossness through the southern low-level outfall sewer, which has a diameter of 11 feet 6 inches and a fall of 2 feet per mile. At Crossness, all the sewage of the area south of the Thames was pumped either into the river direct or into a tidal reservoir, which, like that at Barking, was constructed for the purpose of enabling the sewage to be discharged on the ebb tide. The power was at first furnished by four beam engines, each of 125 horsepower of the type already described, but the pump rams were in groups of four at each side of the beam center, which was probably thought a better arrangement than that of having one plunger, on account of the great size. The steam cylinders were 4 feet in diameter, with a stroke of 9 feet. Steam was supplied by twelve Cornish boilers, each 30 feet by 6 feet, the working pressure being 40 pounds per square inch. This machinery was designed to pump about 153,000,000 gallons per day. The lift varied between 10 feet and 30 feet, according to the level of the tidal water in the river at the time of pumping. The tidal reservoir covered an area of 6½ acres and had a capacity of 25,000,000 gallons, and, like that at Barking, was covered by brick arches soiled over.

Soon after the works were opened, two auxiliary pumping engines of 300 horsepower were provided. The cost of the buildings, etc., was £395,674 13s. 10d. ($1,925,551) and the engines and other machinery cost £54,176 18s. 6d. ($263,652).

The length of sewers under the control of the London County council is as follows:

	Miles.
North side of Thames:	
Main sewers	113
Intercepting sewers	48
Storm relief sewers	17½
	178½
South side of Thames:	
Main sewers	60
Intercepting sewers	41
Storm relief sewers	4½
	105½
Total	284

The total cost of the main drainage works, as briefly described, was, at the date of opening the Crossness Works, about £4,600,000. Having regard to the magnitude of the undertaking, to the absence of precise information upon many points, the physical difficulties to be overcome, and the opposition encountered, the designers of the scheme have left behind them an enduring monument to their perseverance and ability.

The effect of the works was to intercept the sewage formerly flowing into the river at various points within the metropolitan area, and to transfer it to points about 14 miles below London Bridge. Subsequent events showed that the nuisance as regards the metropolis was remedied, but that the enormous volume of pollution transferred to a lower point reproduced there the insanitary conditions previously prevailing in the heart of the metropolis. That the nuisance became serious is proved by the fact that in the year 1882, a royal commission was appointed to inquire into and report upon the state of the Thames. The inquiry was of a prolonged and exhaustive character, and the report of the commissioners contained fourteen distinct recommendations, and stated that steps should be taken to purify the sewage of the metropolis before its admission to the river.

As a preliminary step, experiments were undertaken by the chemist to the metropolitan board of works, Mr. W. J. Dibdin, in order to ascertain how best to treat the sewage to satisfy the recommendations of the commissioners. The results were submitted to Sir Frederick Abel, K. C. B., Dr. William Odling, Dr. Williamson, and Dr. Dupré, who reported in favor of the treatment proposed. The board then determined to construct works for the chemical clarification of the sewage, and to establish precipitation works at Barking for dealing with the sewage of the north side. In January, 1887, a contract was made for the execution of these works, which may be briefly described as follows:

Barking.—There are thirteen precipitation channels, ranging in length from 860 feet to 1,210 feet, 30 feet in width, of a working depth of about 8 feet, and capable of holding 20,315,925 gallons. These extend over an area of 11 acres and are covered by brick arches. There are two openings to each channel from the main outfall sewers, regulated by hydraulic penstocks 7 feet by 6 feet. The effluent from the above channels passes through the old reservoir and out of the nine openings in it into the river. Any one of the precipitating channels can be shut off for cleansing purposes. There are also twelve sludge-settling channels, each 140 feet long and 20 feet wide, capable of holding sludge to a depth of 13 feet. These channels are for the purpose of further concentrating the solids in the rather liquid sludge. There are stores under them for receiving and storing the finally settled sludge to the extent of 20,000 tons, exclusive of that stored in the sewage-settling channels; and by this means provision is made against foggy weather, when the sludge vessels may be delayed in discharging their cargoes. There are culverts or communications with the various precipitation channels and the sludge-settling channels, also for conveying the sludge to the pumps, liquor stores, etc. There is also an engine house with two boiler houses, one on each side, together with a repairing shop. The engine house contains four 8-inch centrifugal pumps, with 27-inch fans, each driven by a vertical inverted single-cylinder engine, capable of discharging 5 tons per minute. There are also two 12-inch centrifugal pumps with 36-inch fans of the same type as the others, but with more powerful engines. These are for lifting the diluted sludge as run from the precipitation channels into the sludge-settling channels, a maximum lift of 21 feet. Two Murray chain pumps are provided for lifting thick sludge from the lower store into the suction well of the pumps next to be described. There are four horizontal compound pumping engines, with 13-inch high-pressure cylinders, and 22½-inch low-pressure cylinders of 18-inch stroke. The pumps are 13-inch double-acting ram pumps, each rod being coupled to the tail rod of the steam cylinders. Each pump can discharge 4 tons of sludge per minute into the iron main leading to the jetty for loading the steamers. There are three liquor pumps of a similar type to those above mentioned, but with a 12-inch high-pressure cylinder, 21-inch low-pressure cylinder, and 18-inch stroke, the pump rams being 14 inches in diameter. These are for pumping the liquor drawn from the settled sludge through a 14-inch main to the liming station. Two hydraulic engines and accumulators supply power for lifting the 26 penstocks in the precipitation channels. Steam is funished by 10 boilers 22 feet long and 6 feet in diameter, working at a pressure of 75 pounds per square inch. There are sluices for opening and closing the communications between the various chambers, and pipes and appliances for ventilating and flushing the several chambers; and also a lever house which contains the means for lowering the telescopic weirs in the precipitating channels. There is also a river-water settling pond, 218 feet by 155 feet, for supplying water to the liming and iron-water stations.

The liming station, for the preparation of limewater for treating the sewage, includes lime stores, slacking floor, wash mills, pipes and troughs for conveying sewage water from the sewer, and the liquor from the settled sludge to mix with the slacked lime; also six large limewater mixing tanks; an engine and boiler house, coal shed and chimney shaft, and two large iron tanks or reservoirs for limewater above the lime store. There are two 17-inch centrifugal pumps, with a capacity of 22 tons per minute; the maximum lift is 40 feet. Each pump is driven by its own tandem engine, having inverted cylinders, the high pressure being 12 inches and the low pressure 22½ inches in diameter, the stroke 14 inches, and the fan 4 feet 6 inches in diameter, making 250 revolutions per minute. Each is supplied with a surface condenser. The boilers are steel, three in number, 25 feet long, 6 feet in diameter, working at a pressure of 75 pounds per square inch. These buildings are situated about half a mile from the precipitation channels.

The iron-water station is situated below the liming station, and about 300 yards from the precipitation channels. It comprises sheds for storage of protosulphate of iron, with engines, boilers, and pumps for lifting water into the mixers; also distributing pipes for conveying the iron solution into the sewage. In this station there are two 6-horsepower Robey horizontal engines and locomotive boilers, driving shafting, wash mills, iron mixers, and rotary 6-inch water pumps, etc.

Near these works are a superintendent's house and twelve cottages for those workmen whose presence on the works is necessary. There is a light railway, with two locomotives and wagons for conveying coal, lime, and iron from one part of the works to another. The establishment, including liming station, etc., extends over an area of 83 acres 2 roods 27 poles. It was completed in July and August, 1889, at a cost of £430,834 12s. 9d. ($2,096,657), to which must be added the cost of the engines and other machinery, amounting to £42,567 ($207,152). The number of workmen engaged averages 198.

In the treatment of the sewage, the requisite quantity of limewater (nearly 4 grains to one gallon of sewage, equivalent to one-fourth ton of lime per million gallons, or 38 tons per day) is first discharged into the sewage as it flows past this station in the three culverts. The alloted amount of solution of protosulphate of iron is added (about 1 grain per gallon, making 9 tons daily); then the sewage, with its dose of chemicals, flows into the precipitation channels, which were first constructed on the intermittent system (that is to say, when a channel was full it was allowed to be quiescent for a short time to allow precipitation of the sludge). The clarified effluent was carefully drawn off through the telescopic weirs into the old reservoir, and thence to the river through the nine-channel outlets previously described. When it was necessary to remove the sludge from any channel the large penstocks to each channel were closed, and the supernatant effluent was drawn off by the telescopic weirs regulated from the lever house until the sludge was reached. The sludge was then run off through a culvert into the sludge store chamber, and was lifted by centrifugal pumps for further consolidation in the sludge settling channels. The settled sludge, which contains between 87 per cent and 91 per cent of moisture, is run off, as required, into a store under the engine house, and is pumped through a main along the jetty to the sludge boats, or may be run into a still lower store under the settling channels, should there be more than the boats can discharge at sea through delay by fogs, etc.

Sludge vessels.—The first sludge vessel was built by the Naval Construction and Armaments Company, of Barrow, at a cost of £16,353 ($79,582). It arrived in the Thames at the end of June, 1887, and was named the *Bazalgette.* This vessel was found to work satisfactorily and a second, with certain improvements, was ordered from the same builders. The following is a complete list of the vessels now found necessary for the disposal of the sludge:

Name of vessel.	Trial trip.	Horsepower on trial.	Length.	Breadth.	Depth.	Molded depth.	Cost.
			Ft. in.	*Ft. in.*	*Ft. in.*	*Ft. in.*	£
Bazalgette	Aug. 18, 1887	900	230 2	38 2	13 8	14 6	16,353=$79,482
Barking	Apr. 1, 1889	1,150	232 3	38 2	15 0	15 6	24 875=121,054
Binnie	Mar. 21, 1892	1,251	232 1	38 2	13 8	14 6	26,500=128,962
Barrow	May 18, 1892	1,025	232 1	38 2	13 8	14 6	26,500=128,962
Belvedere	May 31, 1892	1,094	232 1	38 2	13 8	14 6	26,500=128 962
Burns	Apr. 10, 1895	1,136	234 0	38 2	13 8	14 6	23,750=115,579

The sludge is delivered to the vessels through telescopic sludge-loading pipes, the inner and lower ends revolving upon a hollow trunnion, which allows the upper end to radiate to different levels, to suit the state of the tide. The first two vessels are loaded through ordinary hatchways, and the last four vessels are constructed with a central hopper, into which the sludge is received from the loading pipes. At the lower part of this hopper four rectangular valves are placed, each governing the inlet to one of the four compartments into which the sludge tank is subdivided by a longitudinal and thwartship bulkhead; each subdivision carries, approximately, 250 tons of sludge. Each compartment is about 61 feet 6 inches long, by a maximum width of 19 feet, and is about 8 feet high. The bottom of the tank when empty is about 9 inches above the light-load line, and each vessel discharges her cargo by gravity. The minimum time taken to discharge 1,000 tons through the eight valves is six minutes. Between the bottom of the tank and the bottom of the ship, a distance of about 6 feet, is an air space to give the ship the requisite buoyancy; the sludge is discharged through this space by means of tubes. Forward of the sludge tanks the crew space is formed, with berths for the seamen on one side of the ship and firemen on the other; and the space between this and the bow is occupied by ship's stores, chain locker, fresh-water tank, rope locker, and paint room. Below the crew space and stores a water-ballast tank is formed, holding about 170 tons of water, which is pumped in or out by the ballast pump in the engine room as required. Abaft the sludge tank is the stoke hold, containing two multitubular boilers, having together a heating surface of 2,800 square feet, working at a pressure of 150 pounds per square inch, and the coal bunkers, which contain between 40 tons and 60 tons of coal. Further aft is the engine room, containing two twin triple-expansion engines, each having steam cylinders 15 inches, 23 inches, and 35 inches in diameter, with a stroke of 2 feet. The engines indicated together about 1,000-horsepower on the trial trip. The engine room contains also centrifugal circulating pumps, feed pump, 2-inch feed-water makeup, lathes, etc. Abaft the engine room is the tunnel used for the screws and lockers for engine stores; above this are the officers' quarters and mess room and steward's pantry. Between the officers' quarters and the stern are battened lockers and a bathroom; below is a small water-ballast tank, which, if filled, immerses the screws deeper in the water when the ship is light. On deck forward is an anchor deck, lamp room, steam windlass, mast and derrick loading hopper bridge; below is a room for the steam quartermaster's steering engine, a saloon containing two state rooms, galley and coal chute; and above the boiler casing are two fresh-water tanks which contain 3 tons of fresh water for supplying the boilers. There is a fire service with six screwed unions for attaching hose, supplied from the ballast pump, for use in case of fire and for washing down the decks and sludge tanks. The arrangement of the *Burns* differs from that of the three earlier vessels chiefly in the captain's room being on deck, and by being fitted with electric light, the dynamo being in the engine room. Each ship is manned by a crew of 23 officers and men.

The ships convey the sludge to that part of the estuary some miles beyond Southend or Shoeburyness known as the "Barrow Deep," where it is distributed over a length of 8 miles to 10 miles in the open sea. Although the sludge can, upon emergency, be discharged in six minutes, in practice one hour is occupied, during which time the vessel is steaming ahead at her usual speed of 10 knots, thus distributing the sludge over a large area.

Soon after the completion of the precipitation works at Barking, it was found that the sewage would have to be screened on account of the large amount of floating substances passing through the tanks and flowing off with the effluent water. In July, 1890, the contractors commenced a filth hoist over the three lines of sewers at the liming station, in which are machinery and appliances for raising and lowering large iron cages or screens. These are duplicated, one being down while the other is raised and cleared. There is a refuse destructor, with two cells, to burn the rubbish from the screens. These works were started on the 21st of July, 1891, and cost £8,488 ($40,906). The destructor has been much used since that time with the assistance of coke breeze, but the quantity obtained exceeds that consumed by the destructor, and a barge load per week has been removed down the river for use on agricultural land.

Crossness.—While the works were being carried out at Barking, plans for those required at Crossness were prepared, with such improvements as resulted from experience gained at the former place. A contract was entered into on the 4th of May, 1888, which comprised the alterations to the existing reservoir by converting it into four precipitation channels, constructing other two adjoining, sludge-settling channels, liming and iron water stations, settling ponds, engine and boiler houses, coal vaults, chimney shaft, superintendent's house, 3 houses for the staff, 29 cottages for workmen, a schoolhouse for children, a pier, jetty, and tramways.

The length of the channels of the old reservoir is 559 feet 10½ inches, and each has a width of about 128 feet and a capacity of 4,421,719 gallons. The two new precipitation channels are 558 feet 4 inches long by about 99 feet wide, and each has a capacity of 1,953,125 gallons, making a total of 21,593,126 gallons of precipitation-reservoir capacity, built in the form of vaulted subterraneous galleries. There are eight sludge-settling channels, each 130 feet long by 22 feet wide, with a working depth of 13 feet, and with an upper and lower sludge store. The precipitation channels have an average working depth of 10 feet. The sludge-settling channels hold on an average 15 feet in depth. There are seven limewater mixing tanks, about 60 feet long and 23 feet wide. There are also two large river-water settling ponds. The jetty is about 300 feet long and 17 feet in width, with the end in the shape of the letter T, the western arm being 105 feet and the eastern 195 feet long and 23 feet in width. There is also a lime store and a slaking shed and an iron-water mixing shed. The engine and boiler houses were constructed for the treatment and precipitation of sewage, and for pumping the sludge through 16-inch mains to the steamers. At Crossness, the lime and iron water are added to the sewage immediately after it reaches the main pumping engines. The sewage is then pumped into the above-described precipitation channels. After the sludge has precipitated, one of the tanks is shut off from the remainder, the upper portion of the liquid is carefully drawn off, and the sludge is pushed into the sludge sump from the tank floor, whence it is raised into the settling channels by two inverted three-cylinder compound engines, each cylinder driving a plunger pump of 21 inches diameter; the high-pressure cylinders are 14 inches in diameter, and the two low-pressure cylinders 18½ inches diameter with 2 feet stroke. The maximum lift is 36 feet.

When the sludge has settled, the liquor is decanted by telescopic weirs to be returned for reliming, for which purpose it is raised by two 8-inch centrifugal pumps, the steam cylinders being 7 inches diameter and the stroke 8 inches. The water for liming is taken from the river and pumped into liming tanks by four horizontal compound double-ram engines, having 14-inch and 26-inch cylinders, driving a double-acting ram 18 inches in diameter by 2 feet stroke. These pumps have a maximum lift of 36 feet. The lime is first treated in three wash mills 12 feet in diameter, the water for them being taken by two 6-inch centrifugal pumps from that lifted by the main pumping engines. The 6-inch centrifugal pumps and the wash mills, together with the iron crushing mills, are driven by compound Davy-Paxman engines, having two high-pressure cylinders 8 inches in diameter, and low-pressure cylinders 12¾ inches in diameter, with an 18-inch stroke.

The sludge collected from the sludge-settling channels is raised and discharged into the ships by two three-cylinder inverted compound engines. The high-pressure cylinders in this case are 18½ inches and the low-pressure cylinders 22 inches in diameter, with 22-inch pump rams, the stroke being 2 feet and the maximum lift 54 feet. These engines have each a pumping capacity of 10 tons per minute. Two horizontal hydraulic pumping engines, and two accumulators are employed to supply power for lifting the large penstocks. The engines supply 2½ cubic feet of water per minute at a pressure of 800 pounds per square inch. Each engine has two horizontal cylinders, high pressure, 9 inches in diameter, and the low pressure 12 inches. The two accumulators have 10-inch rams with a stroke of 7 feet. These engines also supply power for raising the filth hoist, lime lift, and ash hoist, and control the telescopic sludge loading pipe. The effluent passes in its transit to the pumps through three surface condensers, each holding its own ,independent steam-driven duplex double-acting air pump. Each condenser has 162 tubes 8 feet long and 2 inches diameter. They are connected by a pipe with the exhausts of all the engines in the precipitation engine house, and considering the lengths of the connecting pipe, give a fairly good vacuum. Steam is supplied to all these engines by two 30 feet by 8 feet Lancashire boilers, working at a pressure of 100 pounds per square inch. These precipitation works were completed and brought into use on the 2d of June, 1892, the cost having been £262,377 5s. ($1,276,858), to which must be added the cost of the engines and machinery, £55,256 7s. 8d. ($268,905). An average of 203 men are employed on these works. The area of land on which the works at Crossness are constructed comprises 37½ acres. The sewage is treated at Crossness in the same manner as at Barking.

Effra pumping station.—In consequence of repeated complaints of flooding, the board of works decided, in 1878, in order to form a relief to the southern low-level sewer when surcharged with storm water, to erect a pumping station at the Effra outlet, Vauxhall, and another at Falcon Creek, Battersea. The Effra pumping station was completed by about the middle, and the Falcon pumping station towards the end, of 1879. At the former, the storm water is raised and discharged into the Effra Creek at any state of the tide, the maximum lift being 17 feet. The pumping machinery consists of a 5-foot 8-inch fan turbine pump, having a vertical spindle driven by bevel and other wheels geared to the crank shaft of an old broad-gauge locomotive engine, obtained from the Great Western Railway Company. The delivery is 4,000 cubic feet per minute, and the steam pressure is 100 pounds per square inch. The diameter of the cylinders is 16 inches, and the stroke is 22 inches. The speed is 118 revolutions per minute. The diameter of the fan is 68 inches, the depth 15 inches, and the speed 134 revolutions per minute.

Falcon pumping station.—At this station, similar arrangements are in force. The lift is only 11 feet, and the total delivery is 6,500 cubic feet per minute. The steam pressure is 100 pounds per square inch, and the number of revolutions per minute is 123. The diameter of the cylinders is 16 inches and the stroke 24 inches; the diameter of the fan is 72 inches, the depth 16 inches, and the number of revolutions is 123 per minute.

Isle of Dogs pumping station.—In order to provide a permanent remedy for the occasional flooding at the Isle of Dogs, it was decided in the autumn of 1885 to acquire land near the river and to erect pumping machinery. The engines are high-pressure horizontal condensing in duplicate, with 27-inch cylinders and 3 feet stroke, making 28 revolutions per minute. Each engine actuates two single-acting lift pumps 40 inches in diameter, with 4 feet stroke. There are two Cornish boilers 22 feet by 6 feet, working at a pressure of 60 pounds per square inch. Each pump is capable of lifting 1,600 cubic feet per minute, or together 3,200 cubic feet per minute.

from a depth of 20 feet. These are used for storm water, and discharge into the river Thames. These works came into operation in 1888, and cost about £25,000 ($121,663). The following table shows the work performed at this station, which comes into operation when there is a combination of heavy rainfall with a high tide or other special circumstances:

Year.	Hours of working	Rainfall.
		Inches.
1889	1,091	28.3
1890	226	23.8
1891	292	25.5
1892	101	22.1
1893	233	19.4
1894	241	27.1
1895	64	19.9
1896	38	20.9

This shows an average during the seven years of 321 hours, or thirteen days per annum. It will be observed that since the northern low-level sewer has been duplicated (1894), the storm water pumped into the river is much less than before.

King's Scholars' Pond pumping station.—Previously to 1890, many complaints were received from the local authorities and residents in the district of Westminster about frequent flooding of houses in the locality. This was due to the overcharging of the sewers, and in June, 1890, it was proposed that pumping machinery, consisting of centrifugal pumps actuated by gas engines, should be erected on the King's Scholars' Pond sewer at the point where it formerly discharged into the Thames. The building was erected, and two 100 I. H. P. Otto gas engines, working at 160 revolutions per minute, were supplied. Each engine drives a 24-inch centrifugal pump, running at 200 revolutions per minute, having 4-foot fans, with a lift of 15 feet, and discharging 44 tons per minute. The cost of this station was £5,662 ($27,554). From the 24th of July, when first started, to the 31st of December, 1894, the two engines and pumps worked for 66 hours 35 minutes. For the year 1895, they worked for a total period of 73¼ hours, and during 1896, 73 hours 35 minutes—that is to say, when the tide would not permit the storm water to pass through the ordinary outlet into the river. This installation is well adapted for its purpose, and is preferable to steam machinery.

Generally, the main drainage system as described was that in operation or contemplated when the Metropolitan Board of Works ceased to exist, and its duties were undertaken by the London County Council. This body came into office on March 21, 1889, when the late Sir Joseph Bazalgette retired from the office he had held so long and honorably. It may be of interest to note that the ratable value of the metropolis upon the establishment of the late board of works in 1855 was £11,283,665 ($54,911,956); in 1889, when the board became defunct, the ratable value was £31,033,786 ($155,124,042), and the population had correspondingly increased. The first officer appointed by the county council was the late Mr. J. Gordon, M. Inst. C.E., who entered upon his duties in July, 1889, but who died on the 9th of November following, deeply regretted by all who knew him. His successor was Mr. A. R. Binnie, member of council of the institution, who commenced his duties in February,1890, Mr. Santo Crimp, M. Inst. C.E., commencing his duties as district engineer for the northern section of the metropolis at the same time. Mr. Crimp, on his retirement from the service of the council in 1893, was succeeded by Mr. J. E. Worth, M. Inst. C.E., and they have, together with Mr. Hart Bennett, had the honor of carrying on the work described in connection with the main drainage of London under the direction ot Mr. Binnie.

Soon after Mr. Binnie's appointment, he was requested by the council to furnish further information upon the main drainage and sewage disposal of London. Sir Benjamin Baker, K. C. M. G., past president of the institution, was associated with him, and their joint report suggested: (1) The construction of additional relief sewers in the metropolis for the further mitigation of the frequent flooding; (2) the enlargement of the main outfall sewers, in order to prevent the too frequent occurrence of overflows of storm water and sewage into the river; and (3), if it should be found necessary after experience, the conveyance of the sewage or the effluent to points lower down the river, where it would be diluted with larger volumes of river and sea water.

The works proposed for the north side of the Thames were estimated to cost £920,000, while those for the south side were to cost £1,300,000. Certain of these works were recommended to be executed forthwith, as of pressing necessity.

The most important of the works carried out by the council is, perhaps, that of preventing flooding in the east end of London, notably in Limehouse, Poplar, and the Isle of Dogs. As originally constructed, what was known as the Isle of Dogs branch, which joined the northern low-level sewer near Bromley station, was 5 feet in diameter, with a gradient of 1 in 5,000. The inverts of the main sewer and of the branch were at the same level, and upon the occurrence of heavy rainfall, when the low-level sewer became surcharged, the sewage backed up into the districts referred to through the branch. It was determined, therefore, to deal separately with that part of the district, for which purpose a new pumping station was erected at Abbey Mills. The low-level sewer was duplicated between that station and the Isle of Dogs branch, but at a lower level, so as to give a free discharge to the sewer, which was then disconnected from the northern low level. The new sewer is 9 feet in diameter and about three-fourths of a mile in length, and it has proved effectual in preventing the flooding which was formerly so frequent. Since it came into operation, not a single complaint has been received. This work has also resulted in a large addition to the pumping power available at Abbey Mills, as the new pumping machinery at that station is capable of lifting 36,000,000 gallons per day to an average height of 40 feet, so that not only are the districts referred to relieved, but more power is available for dealing with the sewage delivered at the Abbey Mills station by the northern low-level sewer. The pumping machinery at the new station consists of a pair of triple-expansion Worthington engines. The high-pressure cylinders are 14½ inches, the intermediate 28½ inches, and the low-pressure 33 inches in diameter, with a stroke of 4 feet. The rams of the pumps are 3 feet in diameter, with a stroke of 4 feet. These works cost in all about £77,000 ($374,721). Communication was also made with the northern low-level sewer, in order that the sewage could, in an emergency, be pumped at either station.

The next work of importance carried out in accordance with the recommendations in the report referred to is the increase of the pumping capacity at Crossness, which works are now in hand, and are estimated to cost £76,000 ($369,854). Having regard to the rapid growth of population, the time can not be far distant when the larger works suggested in the report must be undertaken.

It is necessary to refer to the improvements made in the works handed over to the county council as suggested by experience.

In regard to the pumping machinery, much progress has been made since the date when the works were originally constructed, and steam is now employed at much higher pressure. The coal bill at the various stations was found to be very large—at least 50 per cent more than it should be with first-rate machinery and high-pressure steam. The pumps, moreover, at Abbey Mills, which were of the double-acting piston type, were worn out. As a result, the sewage could never be pumped down in the northern low-level sewer, which was surcharged as far up as Westminster. The improvement of the machinery at this station was therefore undertaken at the earliest possible moment. All the old boilers were removed, and ten new Lancashire boilers, each 30 feet by 8 feet, seven working at a pressure of 100 pounds and three at a pressure of 150 pounds per square inch, were substituted, the boilers being provided with mechanical stokers and fuel economizers. After the new boilers were fixed, the compounding of the machinery was proceeded with. New pumps were also provided, and the machinery at this station may be said to fully accord with the latest practice. The work was carried on without causing any interruption in the work of pumping the dry-weather flow, together with as much rainfall as the machinery in work was capable of. This work was carried out from 1892 to 1895, and has cost £21,000 ($102,197). The cost of pumping the sewage before the alterations was between 16s. and 17s. ($3.89 and $4.14) per million gallons, while subsequently it became only 11s. ($2.68) per million gallons. But more important than this, from the sanitary point of view, it may be stated that the northern low-level sewer is now kept pumped down, and that there is in consequence an enormous reservoir capacity available in this sewer and its branches for the reception of moderate rainfalls, which before the alterations caused frequent overflows into the river. Sixty-eight men are employed at this station, and the work is performed continuously.

At Crossness, the four rams on each pump, already referred to, were removed, new pump barrels, with single plungers 9 feet in diameter, were substituted, and the compounding of the engines is now being proceeded with on the same general lines as those at Abbey Mills. The estimated cost of this work is £76,000 ($369,854). The substitution of the large plunger has proved quite satisfactory.

At Deptford, too, the work of compounding is well in hand, of which the new boilers, seatings, economizers, etc., have cost £11,614 ($56,520). Also, in order to deal with the storm water discharged into the low-level sewer at Battersea, the late board built the two relief pumping stations, one at the Falcon Brook and the other over the Effra Creek, as described. As these stations have single pumps only, it was proposed to duplicate them; but the space, particularly at the latter station, being so limited it has been decided to build a new station at Heathwall, in Nine Elms Lane, this being approximately midway between the other two stations. This station is fast approaching completion, and will contain three horizontal Otto gas engines, each of 200 indicated horsepower, driving three belt-driven centrifugal 28-inch pumps. The capacity of each pump will be 66 tons per minute, with a lift of about 20 feet. The cost of the land, buildings, etc., is about £16,500 ($80,297), and that of the machinery £5,238 ($25,491). The mechanical work has been executed under the superintendence of Mr. E. T. Atkinson.

The precipitating channels at Barking were designed for use on the intermittent system, and were provided with large telescopic weirs for the purpose of decanting the effluent water; but in practice it was found impossible to produce a satisfactory effluent by this means, as was indicated by the small amount of sludge produced, namely, 7,300 tons per week, being less than one-third of the quantity known to be contained in London sewage. Moreover, crude sewage was frequently discharged into the river during periods of heavy rainfall. The matter received the careful and anxious consideration of the chief engineer, and as a result it was determined to build weir walls across the farther ends of the precipitation channels, to abandon the telescopic weirs, with the exception of those necessary for decanting the effluent for cleansing purposes, and to treat the sewage upon the continuous system. These alterations were carried out in 1891 at a cost of £1,890 ($9,198), and the immediate result of the alteration in the mode of working was to raise the production of sludge to 23,000 tons per week, while in 1895 the sludge sent to sea averaged 26,760 tons per week, the increase in population and more perfect methods of working accounting for the latter increase. It may be said that as a consequence of these improvements, since March, 1892, no sewage has passed direct into the river at the outfall works, for no matter what storms have occurred in London, all that has come to Barking has first been treated and passed through the precipitation channels. While the works were in progress, the experience gained at Barking was brought to bear upon those at Crossness, the designs were altered, and the works as completed are upon the same general lines as those at Barking. The average weekly production of sludge at this station during 1895 was about 15,000 tons per week.

Among other improvements, either in progress or about to be carried out for the further improvement of the main drainage works, may be mentioned the provision of large steel sludge tanks at Barking, situated at a sufficient elevation to permit of the sludge gravitating into the steamers; so that night and Sunday pumping of the sludge is not necessary, and the loading of the steamers is much facilitated. These tanks hold about three shiploads, or upward of 3,000 tons, and cost £11,220 ($54,602). Telescopic weirs were introduced, at a cost of £1,710 ($8,322), into the sludge-settling channels at Barking, to facilitate drawing off the liquor from the settled sludge, thus enabling the latter to be sent to sea in a more concentrated form. A not unimportant improvement has been that of dealing with the liquor drawn off from the settled sludge, separately from the main body of sewage, into which it was formerly discharged. This liquor, amounting to 1,200,000 gallons per day at Barking and 600,000 gallons at Crossness, which is approximately 1 per cent of the daily sewage flow, is treated with 20 grains of lime and 10 grains of proto-sulphate of iron per gallon, which quickly precipitates the suspended matters and deodorizes this black and filthy liquid. The jetty was also lengthened and widened in order to provide more berthing room for the steamers, and to permit of the lime, coal, and other stores being delivered alongside by steamer at all states of the tide.

The drainage of North Woolwich is also about to be undertaken, at a cost of £67,000 ($326,056), the sewage from this part of the metropolis having hitherto passed direct into the Thames.

Experience has suggested certain other improvements at Barking, mainly in the shape of a liming station to be constructed upon the foreshore of the river alongside the jetty, which will obviate the necessity of conveying the lime to the present liming station, upward of one-half mile distant, and will also enable a more perfect solution of lime to be produced. The lime water will be conveyed from this new station to the main outfall sewers at a distance of about 500 feet above the new liming station, to which place it will be conveyed in a channel. Clarified sewage effluent will be used in the manufacture of this lime water, in place of the sewage which has been used hitherto. This liming station, with the necessary adjuncts, will cost about £60,000 ($291,990).

Other works of an important character are contemplated, including a new sewer from Hackney Wick to Abbey Mills for the purpose of relieving the river Lea from the too frequent overflows of storm water; also the erection at Chelsea of a storm-water pumping station with gas engines and pumps, like those provided at the Heath Wall and Kings Scholars Pond outlets. The cost of these works will be about £50,000 ($243,325).

A small but not unimportant addition to the main drainage works at Barking may be mentioned, namely, the artificial filter, which is generally known as the coke-breeze filter, and was the outcome of certain experiments made on smaller filters in 1892. The experimental work in connection with these filters has been published and the results are generally known. The authors may, therefore, confine their remarks to a bare statement of fact that the filter composed of coke breeze gave the best results. As the works are situated near the Beckton gas works, where large quantities of breeze and cinders are produced, and as it was found that these materials could be obtained alongside the council's works at a cost of about 1s. 6d. per ton, it was determined to make a filter of them with a superficial area of about 1 acre. This filter was constructed for the main drainage committee by Mr. Crimp, in 1893, at a cost of about £2,000 ($97,330). It consists of 3 feet of what is known as pan breeze, or cinder, with a layer of gravel at the top 3 inches in thickness, intended to act as a weighting material. Advantage was taken of the experience gained in working the smaller filters, and arrangements were made for the filter to be charged with effluent from the precipitation channels; the effluent can then be kept in contact with the filter for any required length of time; the purified effluent then flows off by a channel into the Thames, and the filter is again charged. As is well known, the purification of the effluent is effected by means of organisms which establish themselves in the filter, and the amount of purification effected depends upon the length of time the effluent is allowed to remain in contact with these organisms. In practice, it is found that a purification of about 78 per cent of the dissolved organic matters can be effected with a contact of about two hours. The filter is worked day and night for six days of the week in periods of eight hours. In each period the filter is charged, the time occupied being about one hour, the effluent remains in contact for two hours, while the remainder of the time is occuped in drawing off the filtrate. The volume dealt with per twenty-four hours, when the filter is in operation, is 1,000,000 gallons; and so far as present experience goes, the filter is apparently capable of continuing its function for a considerable period of time. This filter indicates that if it should ever become necessary to further purify the effluent generally, as now discharged into the Thames, the object sought to be attained might be accomplished by means of filters of the kind referred to.

Sewage discharged at Barking Outfall, three-monthly periods, 1893-1895.

Year.	Dry days.	Average daily discharge.
1893.		*Gallons.*
First three months	34	108,039,000
Second three months	65	106,777,000
Third three months	32	113,720,000
Last three months	30	102,373,000
The whole year	161	107,377,000
1894.		
First three months	24	115,167,000
Second three months	33	112,478,000
Third three months	33	120,306,000
Last three months	27	99,759,000
The whole year	117	112,045,000
1895.		
First three months	44	125,160,000
Second three months	53	128,437,000
Third three months	45	115,447,000
Last three months	40	98,582,000
The whole year	182	116,990,000

As to the dry-weather flow of sewage on the north side of the Thames, the authors have had some difficulty in determining what are and what are not "dry days." In order to obtain a fair standard of comparison, it was considered that those days may be said to be dry on which there is no fall of rain either on the day itself or during the previous twenty-four hours. Adopting this standard, it is found that the number of dry days in 1893, 1894, and 1895 were, respectively, 161, 117, and 182. In the table preceding will be found the figures for these periods set out for the whole of the years in question, and also for each of the four quarters of the years.

In investigating, however, the dry-weather flow of sewage, it is necessary to bear in mind that it varies considerably during the several days of the week, as will be seen from the following table:

Average dry flow of sewage on different days of the week during the years 1893, 1894, 1895.

Day of the week.	1893.		1894.		1895.	
	Dry days.	Average daily discharge.	Dry days.	Average daily discharge.	Dry days.	Average daily discharge.
		Gallons.		*Gallons.*		*Gallons*
Sunday	26	96,364,000	18	99,664,000	27	102,565,000
Monday	24	103,414,000	18	107,135,000	31	116,918,000
Tuesday	23	110,097,000	19	117,765,000	28	120,078,000
Wednesday	18	114,307,000	13	116,305,000	24	125,955,000
Thursday	19	110,387,000	15	117,195,000	24	120,851,000
Friday	27	111,927,000	18	113,655,000	23	121,331,000
Saturday	24	108,557,000	16	114,945,000	25	116,186,000
Total	161	....	117	....	182	....

Experiments bearing on the question of the discharging capacity of sewers have been made upon the three main outfall sewers to Barking, which were designed in accordance with the formula:

$$v = 53.64 \sqrt{H2\ F},$$

and were calculated to discharge 33,800 cubic feet per minute, or a maximum with a chord subtended by an angle of 49½° (about $\frac{19}{20}$ full bore), 34,000 cubic feet per minute. As a fact, continuous automatic records, taken within all reasonable limits of accuracy upon the three 10-foot weirs at the outfall works, show that during periods of great storms the discharge reaches 45,062 cubic feet per minute, the last occasion having been on the 18th of March, 1896. This is at least 29¼ per cent more than the sewers were originally calculated to carry. These sewers can not become surcharged, and therefore do not work under pressure. The ordinary dry-weather flow is 13,000 cubic feet per minute, and the maximum discharge during heavy falls of rain is, as stated, about 45,000 cubic feet per minute.

It is difficult to appreciate the vastness of the work carried on in connection with the disposal of the sewage of the metropolis. A staff, consisting of 460 men on the north side of the Thames, 310 men on the south side, and 150 men on the sludge vessels, is engaged in this work of pumping and chemically treating and dealing with the sludge of the 75,000 million gallons of sewage produced in each year, which is transformed into a clear innocuous effluent flowing into the Thames. The sludge, consisting of 2,169,000 tons per annum, is conveyed 50 miles down the river and deposited in the German Ocean, leaving no trace either in the sea or on shore. The work proceeds incessantly night and day, in order that the daily flow of 205 million gallons of sewage may be disposed of without offense; and all who are familiar with the lower reaches of the Thames will agree that the pollution of the river is thus practically prevented.

TREATMENT AND DISPOSAL OF LONDON SEWAGE DURING 1896.

[Extracts from report by the chief engineer, on the treatment of sewage at the Barking and Crossness outfall works, and the conveyance of sludge to sea, together with a return of the storm overflows into the rivers Thames and Lee from the council s sewers, during the year 1896.]

In reviewing the operations carried on at the two outfalls at Barking and Crossness during the year 1896, both as regards the actual work done and the cost thereof, a few prefatory remarks, similar to those given in the previous reports, become necessary.

It will be remembered that the two outfalls north and south of the river Thames differ in one important particular. At Barking, the sewage is delivered through the three parallel outfall sewers by gravitation on to the site of the works, and is there treated without the necessity of any preliminary pumping; while at Crossness, on the other hand, the sewage which is received at the outfall station has to be pumped by the main engines; consequently, in reviewing the work of the two stations it becomes necessary, for the purpose of comparison, to exclude in the case of Crossness the cost of pumping and other expenses incidental to this operation. Another point which must be borne in mind is that the quantity of crude sewage dealt with at Barking and Crossness stands in the relation of about 45½ at Barking to 30½ at Crossness, or in other words, 60.02 per cent of the total quantity of sewage received at the outfalls is treated at the former station and at the latter, only 39.98 per cent. Again, the quality of the sewage at the two outfalls is different, that at Barking being of a much heavier and stronger description than that at Crossness.

The working of the fleet of six sludge steamers has also been taken out, and considered not only with regard to the two outfalls, but also with respect to each vessel separately.

I may say that during the past year none of the effluent water from the works was deodorized, as it was not found to be necessary.

To arrive at an approximately correct idea of the cost of the whole work, it becomes necessary to take into account the capital expenditure which has been incurred, and the annual payments on account of sinking fund, and interest in each particular case.

In dealing with the latter subject, I have placed myself in communication with the comptroller, and have arrived at figures which I hope will prove satisfactory to the committee. It should be borne in mind, however, that the cost for interest, owing to the system on which loans are repaid, will be a continually decreasing sum as the principal is paid off.

WORK DONE.

During the year 75,654½ million gallons of crude sewage were received and treated, or an increase of 0.80 per cent on the quantity in 1895; and 2,178,000 tons of sludge, which were obtained with a moisture varying from 91.08 to 91.44 per cent, were sent to sea, or an increase of 0.41 per cent on the quantity obtained last year. In other words, one ton of sludge was extracted from every 32,204 gallons of crude sewage at Barking, and from every 39,148 gallons at Crossness. This is a decrease of one-half per cent at the former and an increase of 1.7 per cent at the latter, indicating that the sewage in the year 1896 was not so diluted at Barking and more diluted at Crossness than it was during the preceding year. The rainfall was 2.19 inches more in 1896 than in 1895.

The absolutely dry solid matter sent to sea would be represented by 43.43 grains per gallon from Barking and 34.27 grains per gallon from Crossness. This at once shows that we have to deal with a different description of sewage on the two sides of the river, and a larger proportion of lime per gallon was used at Barking than at Crossness, in the proportion of 4.84 to 3.56 grains per gallon. The effluent produced at the two outfalls is said to contain solid matter in suspension of an average of 7.9 grains per gallon at Barking to 5.2 at Crossness, showing that the former is an increase of 2.6 per cent and the latter of 6.12 per cent on the figures of 1895. As each sludge ship carries, on an average, 1,000 tons, 2,178 double voyages, of say 100 miles each, have been performed by the fleet.

In all the above calculations, no account has been taken of the large quantities of sand and fine gravel which are brought down by the sewer and deposited in the precipitation channels, and which on being removed by hand are run to spoil at the two outfalls, and not sent to sea, although the cost is of course included in all the working expenses.

COST.

Passing now to the question of cost, I propose (1) to treat the whole operation from the largest and broadest point of view, in which is taken into account the capital expenditure on works, the annual working expenses, interest on borrowed money, and the repayment of capital, stating them for each of the two outfalls at Barking and Crossness and for the working of the sludge steamers, as well as for the total operations carried out as a whole. After this I propose (2) to analyze more in detail the actual working expenses in each case, setting aside in this instance the capital charges which will have been previously taken into account.

(1) *Total cost including capital charges.*

	£	s.	d.	
At Barking the total capital expenditure on works amounts to	514,980	0	0	= $2,506.150
The working expenses, including precipitation, experimental filtration, and the treatment of the sludge, together with the pumping required to put it on board the ships, amount to	52,135	4	6	= 253,717
The allowance on capital is composed of two items:				
On account of principal	10,110	0	0	= 49,200
For interest	13,460	0	0	= 65,503
Total	75,705	4	6	= 368,420

As 45,407¼ million gallons were treated at Barking, the resulting cost has been at the rate of £1 13s. 4d. ($8.09) per million gallons, this being a slight increase on the previous year, which stood at £1 12s. 6½d. ($7.90).

	£	s.	d.	
Turning now to Crossness we find that the total capital expenditure on works has been	333,059	0	0	=$1,620,832
The working expenses of all kinds on precipitation and pumping sludge into ships	21,138	7	7	= 102,870
The allowance for expenditure on capital account was—				
On account of principal	7,890	0	0	= 38,397
For interest	9,280	0	0	= 45,161
Total	38,308	7	7	= 186,428

giving a rate of £1 5s. 4d. ($6.15) on 30,247 million gallons treated at this station, a slight reduction on the previous year, which stood at £1 6s. 7½d. ($6.46).

	£	s.	d.	
Referring again to the sludge ships we find that the total capital expenditure has been	146,490	0	0	= $712,894
The cost of working	30,884	0	5	= 150,297
Repayment of principal	6,600	0	0	= 32,119
Interest paid	4,170	0	0	= 20,293
Total	41,654	0	5	= 202,709

or at the rate of 4.59d. per ton on the 2,178,000 tons of sludge sent to sea, which is at the average rate of 0.0459d. per ton per mile, or, as compared with the previous year, an increase of 0.0462d. per ton. Each trip has cost on an average of £19 2s. 6d. ($93), or 3s. 9.9d. (93 cents) per mile, or about 0.65 per cent less than the previous year.

From the above figures we arrive at the gross result that the work of the year 1896 has been carried out, when working expenses and capital expenditure are taken into account, for a sum of £155,667 12s. 6d. ($757,556), as compared with £154,945 4s. 2d. ($754,041) in 1895, and £150,231 14s. 6d. ($731,103) in 1894, or a total average cost for precipitation, filtration, and conveyance to sea at the rate of £2 1s. 1.82d. ($10,013) per million gallons on the gross quantity of 75,654¼ million gallons of sewage received and treated at the two outfalls, or at the rate of 16s. 3.08d. ($3.96) per ton for the 191,513 tons of solid matter removed from the sewage.

This forms the first broad and general view of the question when all expenditure is taken into account, without attempting to analyze any of the more detailed operations which I propose to examine under the head of "working expenses."

(2) *Working expenses.*

The operations in connection with the treatment of sewage divide themselves under the following heads: Precipitation, which includes the operations at the filth hoists, the treatment with chemicals, and the drawing off of the effluent water; sludge (land cost), the work done by flushers in clearing the precipitation channels, settling in the sludge store, pumping off the liquor, and pumping into the ships; sludge (sea cost), the conveyance of the sludge to sea by ships.

At Barking, the precipitating of the solids from 45,407¼ million gallons cost £40,177 18s. 11d. ($195,526), or at the rate of 17s. 8.36d. ($421) per million gallons. At Crossness, on the other hand, the smaller quantity of 30,247 million gallons cost £16,040 18s. 3d. ($78,063), or at the rate of 10s. 7.27d. ($2.58) per million gallons. This is to a considerable extent accounted for by the fact that at Barking 4.84 grains of lime per gallon were used, as compared with 3.56 grains at Crossness for precipitation.

The land charges for the treatment at Barking of 1,410,000 tons of sludge were £11,730 11s. 8d. ($57,087), or at the rate of 2d. (4 cents) per ton, while the 768,000 tons at Crossness cost £5,097 9s. 4d. ($24,807), or at the rate of 1.59d. (3.2 cents) per ton. The cost of conveying sludge to sea was at the rate of 3.40d. (6.8 cents) per ton at Barking, and 3.40d. per ton at Crossness, or an average for the total quantity of sludge of 3.40d. (6.8) cents per ton per trip, or at the rate of .034d (0.06 cents) per ton per mile, taking the average loading and unloading to extend over 100 miles per trip.

DISPOSAL OF REFUSE IN LONDON.

[Extracts from reports of streets committee, printed in 1897.]

The area of the city is equal to 1 square mile, containing close upon 50 miles of streets, courts, and alleys, the carriage and foot ways of which require the attention of the scavengers continuously, by night as well as by day.

There are about 28,000 houses and holdings from which the dust and trade refuse is regularly removed, and when it is borne in mind that no less than 1,250,000 persons and about 100,000 vehicles enter the city daily, the cost and difficulties of removing the refuse and cleansing the streets will be better appreciated.

Four hundred and thirty-seven men and youths and 179 street orderly boys are engaged in the work, in addition to about 50 women sorters, who are paid respectively, according to service and ability, as follows: Boys to youths, age 13 to 16, 6s. 6d. to 10s. ($1.58 to $2.43); youths to men, age 16 to 21, 10s. to 20s. ($2.43 to $4.87); men, age 21 and upward, 21s. to 28s. ($5.11 to $6.81); women, 9s. to 15s. ($2.19 to $3.65). The commissioners have 96 horses and about 100 carts, vans, water wagons, and sweeping machines.

The refuse removed from the city can be divided into two heads: House and trade refuse, and street sweepings and slop, including market refuse, but not diseased meat or poultry. The quantities removed during the year 1894 were, as under house and trade refuse, 41,626 tons; street sweepings and slop, 31,156 tons; total, 72,782 tons; of this, 23,160 tons were burned in the destructors, leaving about 20 per cent, or 4,632 tons of clinker, etc., the subsequent removal of which costs about 1s. (24 cents) per ton. The remainder of the dust and trade refuse is sorted and sifted, and all marketable commodities, such as glass, paper, rags, etc., are eliminated, the ashes and breeze being eventually disposed of to brickmakers, and the street sweepings to farmers; the total amount realized last year by the sale of the various articles was £2,680 ($13,042), thereby reducing the expense of sorting and sifting to about 2s. (48 cents) per ton, the gross cost of obtaining this result in wages, getting rid of residue, etc., having been £5,332 ($25,948).

The annual net cost of cleansing the streets and the removal and disposal of the dust and trade refuse from the city, as thus briefly referred to, is about £41,000 ($199,527).

It will be observed that to burn the whole of the city dust and trade refuse, about double the number of furnaces of similar capacity to those at present in use (which consume on an average about 8.6 tons per day of 24 hours) would be required, but if an addition is contemplated to the existing plant, it would be expedient to provide furnaces capable of destroying the street sweepings, etc., as well, so that nothing whatever of an offensive character should remain on the wharf premises a moment longer than is absolutely necessary.

The number of the modern and improved furnaces that would be necessary to consume everything delivered at the wharf would, of course, be governed by the capacity of the destructor selected, and the respective capacities of the different types of furnaces vary considerably.

The methods more or less generally adopted for dealing with refuse may be briefly described as (1) the sorting and sifting process; (2) the system of removal by barge or rail; (3) the process of cremation.

Sorting and sifting.—The sorting and sifting process is too well known to need description; the system is condemned by some from a sanitary point of view, on the ground that all refuse should be destroyed, or got rid of before the products of putrefaction can poison the atmosphere, and that it should not be subjected to any manipulation whatever after it has been collected by the scavengers.

The process, I think, can only be justified here on the score that it finds employment for a few women.

The days of the "Golden Dustman" are of the past. Formerly, no doubt, fortunes were amassed by persons who were lucky enough to secure contracts for the removal of house and trade refuse, at a period, too, when considerable sums were paid to local authorities for the privilege of collecting it.

The brick fields with which London was surrounded created a constant demand for the cinder and ashes, and everything of a marketable nature was readily turned into money. Things are very different now. The rapid growth of the metropolis, the absorption of the brick fields, improved means of combustion in our homes, the adoption of gas stoves, the exigencies of modern sanitation, and the depression in agriculture have combined to entirely revolutionize the business of a dust contractor, who now, instead of paying with eagerness for the privilege, requires a considerable sum from the authorities for removing the refuse.

The barging system.—In order to obtain experience of the result of the barging system—and before considering the question of augmenting the cremators—the committee inspected the wharves of the vestries of Chelsea and St. Margaret and St. John, Westminister, where the barging system is in operation and where burning is not resorted to. These vestries contract for the removal of their refuse, the Chelsea vestry paying 2s. 3d. (54.7 cents) per load (15 to 30 hundredweights per load) for the dust, and 1s. 7½d. (39.5 cents) per cubic yard for the slop, and the vestry of St. Margaret and St. John paying 2s. 7d. (52.8 cents) per load for dust (18 hundredweights per load), and 1s. 8½d. (41.5 cents) per cubic yard for slop. The contracts are for a year, and the contractors are required always to have a barge alongside the wharf, into which the refuse is delivered direct from the collecting carts. Neither vestry appeared to have any official knowledge of what eventually becomes of the refuse, a point which the commission would scarcely care to leave in doubt, for if they adopted the system of barging they would probably require to reserve some sort of control in regard to the destination of the city refuse, in view of possible complaints of it becoming a source of nuisance in another district. This control could only be effectually secured by the commissioners carrying out the work themselves, which would entail the acquisition of barges and a receiving depot on the river, as well as a wharf in the city from which to chute the refuse. Of course, Lett's Wharf could be utilized for the latter purpose, but the cost of cartage, etc., would be greatly enhanced by its distance from the city. There is no doubt that the barging system has its advantages, provided it can be conducted without nuisance. Land could be reclaimed, or the system might be worked in connection with a farm which could be acquired for the purpose, and made profitable as a source of supply of provender for the commissioners' horses. A prolonged frost, however, would seriously interfere with this method of removal, and it must be remembered that in hot weather the continuous passage on the river of barge loads of refuse, etc., must to a more or less degree taint the surrounding atmosphere.

The removal to country depots by railway.—The alternative to barging would be the removal of the refuse by rail, and this method is adopted by the vestry of St. Mary, Newington, who for the past sixteen years have sent their refuse and dust into the country to the two depots acquired by the parish at Meopham and Longfields in Kent.

The storage capacity at the depots renders the vestry to a great extent independent of market fluctuations, and assists them in maintaining the price of road sweepings and ashes and breeze for agricultural and brick-making purposes, respectively. The railway carriage is 1s. 8d. (40.5 cents) per ton. From a return furnished by Mr. Dunham, the vestry clerk, it appears that during the years 1879, 1880, 1881, and 1882, 168,019 tons were sent to the depots, and the amount realized, over and above the cost of railway carriage, was £2,665 19s. 1d. ($12,974), which went toward reducing the cost of collection. Since then, owing to depression in the brick trade and agriculture, results have not been so favorable, although they can not be said to be unsatisfactory.

In the eleven years from 1883 to 1894, the cost of getting rid of a ton of refuse, including railway carriage, after delivery on the trucks, has varied from 4¾d. to 1s. 8d. (9.6 cents to 40.5 cents), the average for the sixteen years being only 10¼d. (21.2 cents) a ton. The net cost per ton, including railway carriage, for the past five years was as under: 1890, 1s. 8d. (40.5 cents); 1891, 11d. (22.2 cents); 1892, 11d. (22.2 cents); 1893, 1s. 7½d. (39.5 cents); 1894, 1s. 7d. (38.5 cents).

The vestry entered into a contract with the vestry of St. George the Martyr to receive the dust and refuse from that parish for the sum of £2,750 ($13,383) a year. This arrangement appears to have resulted in a profit, which is shown in the reduced cost to the vestry in getting rid of their own refuse in 1891 and 1892. Since 1887, they have given the Wandsworth board a shoot for the house dust collected from the parish of Clapham, the board loading the dust on rail, and paying the railway company their charges for carriage, and the vestry 9d. (18.2 cents) per ton, to cover the cost of unloading and shoot. The advantage or otherwise of this method of removal depends chiefly upon the proximity of a suitable railway siding.

Cremation of refuse.—The committee then directed their attention to the process of cremation, and the following particulars of destructors were abstracted and furnished to each member: Manlove, Alliott & Co.'s destructor, fitted with Boulnois & Brodie's patent improvements for charging cells, etc., Liverpool; Livet's patent dust destructor, Halifax; the Beaman & Deas destructor, Warrington; the Engle garbage cremator, New York; Warner's "Perfectus" destructor, Hornsey; the Horsfall refuse furnace, Oldham; the Whiley patent mechanical refuse destructor, Manchester; the Desideratum refuse destructor, Liverpool; Hanson's patent retort utilizer of town refuse, Wakefield.

In London and its environs, where cremation is resorted to, destructors of the Fryer type (similar to that at Lett's wharf) appear to be almost in general use, viz, at Battersea, Hampstead, Whitechapel, Woolwich, and Ealing; at Hornsey the Warner "Perfectus" destructor has been adopted.

Description of destructors.

Name and location of destructor.	Number of cells.	Grate area.	Burning capacity per cell per 24 hours.	Burning capacity per square foot of grate area per 24 hours.	Average temperature.	Dust, refuse, etc.		Residuum in clinker and ash.	How clinker disposed of.	What becomes of refuse not burnt.	Net cost of cremating a ton of refuse delivered at the wharf, exclusive of interest on capital outlay, and repairs.	Annual cost of repairs per cell.
						Quantity collected, 1894.	Quantity cremated, 1894.					
		Sq. ft.	*Tons.*	*Cwt.*	° *F.*	*Tons.*	*Tons.*	*Per cent.*				
Manlove, Alliott & Co.'s destructor (Fryer's system) fitted with Boulnois & Brodie's patent improvements for charging cells, Liverpool.	24	26	*a* 7 to 9	6	*b* 900 to 1,000 *c* 1,500	232,000	45,000	*d* 25 to 27	Part in manufacture of concrete paving, slabs, mortar; remainder barged away to sea.	Barged to sea or sold to farmers.	1s. 1d without patent apparatus for charging cells; 9¾d. with patent apparatus.	*e* About £12 ($58.39)
Beaman & Deas's destructor, Warrington.	3	27	18 to 20	15	2,000	12,750	11,475	17 to 22½	Used for street making and given to farmers.	Tipped into holes and covered up.	5½d. with 2 shifts of men, 12 hours each; 7½d. with 3 shifts of 8 hours each.	About £1 ($4.86)
The "Horsfall" refuse furnace, Oldham.	10	27½	7 to 8	5	1,700	36,500	10,500	33	Part in manufacture of mortar; the remainder sent to tips.	Sent to tips	1s. 2½d	£8 ($38.93)
The "Livet" patent dust destructor; particulars from patentees. *f*	*g* 2	22	12½	8	1,500	(*f*)	(*f*)	(*f*)	....	....	*f* 1s. 6d., according to statistics from Monck street.	

a Messrs. Manlove claim 15 tons for their latest furnaces.
b In cells.
c In cremator.
d 17 to 18 per cent clinker, and 8 to 9 per cent fine ash.
e Includes some alterations.
f The apparatus at Monck street, Westminster, is only used to generate steam to work a 12-horsepower vertical engine, and its working capacity has not yet been thoroughly tested. The residuum in clinker is said to be under 20 per cent.
g To each generator.

Description of destructors—Continued.

Name and location of destructor.	Number of cells.	Grate area.	Burning capacity per cell per 24 hours.	Burning capacity per square foot of grate area per 24 hours.	Average temperature.	Dust, refuse, etc.		Residuum in clinker and ash.	How clinker disposed of.	What becomes of refuse not burnt.	Net cost of cremating a ton of refuse delivered at the wharf, exclusive of interest on capital outlay, and repairs.	Annual cost of repairs per cell.
						Quantity collected, 1894.	Quantity cremated, 1894.					
		Sq. ft.	*Tons.*	*Cwt.*	° *F.*	*Tons.*	*Tons.*	*Per cent.*				
Hanson's destructor and utilizer, Wakefield.	3	a 26¾	16	5	800	6,000	....	6 b 33	For roads and paths, disposed of without payment.	Sold for brick-making, etc., the breeze mixed with pail contents, and sold, as well as sorted materials such as tin, iron, glass, etc.	1s. 2½d........	£13 ($63.26)
Commissioners of sewers' destructor, erected by Manlove, Alliott & Co., 1884, Lett's wharf.	10	26	c 8.6	6	800	41,626 d 31,156	23,160	20	Barged away at cost of 1s. per ton.	Sorted and sifted and marketable commodities extracted and sold; remainder given away or its removal paid for.	1s. 8½d........	About £25 ($121.60)

---

a Per retort or cell.

b Fine ash. Hanson's apparatus being a utilizer, this fine ash, which is a marketable commodity, is not destroyed.

c The patentees claim double the capacity for their modern furnaces.

d Street sweepings.

The following statement shows the estimated annual cost of dealing with the whole of the city dust and street sweepings (say, 72,000 tons) by the various types of destructors and by the other methods of disposing of refuse:

		Per ton.	Annual cost.
		s. d. Cents.	
Sorting and sifting	Lett's wharf (41,626 loads of dust, etc.).	2 0 = 48.6	[a] £4,162 = $20,254
Barging system	Estimate	2 6 = 60.8	9,000 = 43,799
Removal by rail	St. Mary, Newington (price for 1894).	1 7 = 38.5	5,700 = 27,739
Do	St. Mary, Newington (average for 16 years).	10½ = 21.2	3,150 = 15,329
Cremation: [b]			
Beaman & Deas	Warrington	7½ = 15.2	2,250 = 10,950
Fryer's (with patent charging apparatus).	Liverpool	9¾ = 19.7	2,925 = 14,235
Fryer's [c]	Lett's wharf	1 8½ = 41.5	6,150 = 29,929
Horsfall's	Oldham	1 2½ = 29.3	4,350 = 21,369
Hanson's utilizer	Wakefield	1 2½ = 29.3	4,350 = 21,369
Livet	Monck street, Westminster	1 6 = 36.4	[a] 3,120 = 15,183

[a] There would be, in addition, the cost of getting rid of upward of 30,000 tons of street sweepings and slop.

[b] Exclusive of interest on capital and repairs, and without crediting the value of the steam power.

[c] The Lett's wharf destructors were erected 12 years ago. Messrs. Mangrove & Co. claim that their modern furnaces are of double the capacity of the old ones.

MANCHESTER.

Consul Grinnell sends from Manchester, under date of July 22, 1898, the following report on the disposal of garbage in that city, prepared by the chief of the cleansing department:

The duties of cleansing the city of Manchester devolve upon the cleansing committee of the city council, and embrace the collection of all refuse from ash pits, closets and domestic residences, from the city abattoirs, public and private slaughterhouses, markets, warehouses and offices (except trade refuse), and also the cleansing of streets, courts, and passages within the city. When the refuse is collected, it is taken in carts and vehicles which belong to the cleansing committee to one of the several depots within the city, or if the material is considered useless in character and inoffensive in nature it is taken directly and deposited onto tips (vacant land) which are situated on the outskirts of the city. Street sweepings are generally taken direct to the tip, but during the last few years, a considerable quantity of dry street sweepings have been used as an absorbent for liquid feces from works or mills where pail closets are used. The contents of the pails have been taken to the depot where the street sweepings have been accumulated and the two have been mixed together, and useful manure has been the result. There is a demand for manure of this class by farmers on the outskirts of Manchester, but the bulk of street sweepings is taken directly and deposited onto tips. The domestic refuse, refuse from pail closets, and night soil from old-fashioned middens and privies are taken to the tips and there disposed of in a variety of ways.

STREET SWEEPINGS.

The streets of Manchester are cleansed in the following order, viz: First-class streets are swept daily, second-class streets every other day, and third-class streets once a week. All streets within the city are cleansed at least once a week. One-horse sweeping machines are used for sweeping the refuse to the sides of the streets and there men are employed to sweep the refuse into heaps and fill it into carts, which follow the street-sweeping machines after an interval of about an hour. The cleansing committee have 31 of these machines within the city, and each machine is capable of performing the work of 16 men. The cost of collection and removal or disposal will be found in the book of Particulars of Expenditure and Statement of Work Done by the Cleansing Department for the year ending March 31, 1897, sent herewith, pages 34 and 36.[1]

The streets of Manchester are paved principally with granite setts, a very little portion with macadam, and a few streets only with wood. About 100 boys, whom we name orderly boys, are employed to pick up the horse droppings from the streets and deposit these droppings into bins, which are laid into the street and flush with the pavement. These bins are emptied periodically during the day.

The street sweepings are dealt with as has been previously explained. Some of the sweepings are mixed with fecal matter and sent to farmers as manure, but a large portion is deposited in tips. So soon as the tips referred to are filled up, the whole of these sweepings can be advantageously disposed of upon the committee's own estates and to farmers in the suburbs of Manchester.

CLOSET CONTENTS FROM PAIL CLOSETS, OLD-FASHIONED MIDDEN AND PRIVY CLOSETS, ETC.

There are in Manchester 22,990 old-fashioned privies and 76,913 pail closets. There are only 29,981 water-closets, although there are 105,728 dwelling houses, exclusive of offices, warehouses, and other buildings, where water-closets are used. Manchester is essentially a pail-closet city. Some twenty years ago, all the closets within the city were converted from privy or old-fashioned closets into pail closets, and the 22,990 privies which now exist were taken over when the city was enlarged some few years ago, an understanding then being arrived at, before the amalgamation with the outtownships, that these closets should not be altered for a number of years. Since the conversion of the closets referred to into pail closets, the water supply of the city has been very largely augmented, the city council having purchased a water supply at Thirlmere, in Cumberland. They now have no fears of the water supply ever failing. They have also, within the last few years, laid down an extensive and costly system of sewers. Since these two projects were completed, the council have decided that, in future whenever closets require repairing or altering, or when new property is built, water-closets shall be provided, so that in course of time the pail closets of Manchester will be substituted by water-closets. The pail closet consists of a galvanized steel receptacle for the reception of fecal matter (urine and liquid fæces) and a wooden box for dry domestic refuse. The pails and the contents of the boxes are collected weekly, biweekly, or as necessity demands—always once a week. They are collected in vans, which are specially constructed. Each van is capable of holding 24 pails and the domestic refuse from the ash boxes connected with 24 houses. The refuse from the pail closets on the northeasterly side of the city is taken to the cleansing committee's Holt Town works, there to be utilized and disposed of. These works are erected in the northeasterly portion of the city and cost about £150,000 ($729,975). On arrival at this depot, the domestic refuse is emptied into a hopper and passes through a screen, the rough material falling by gravitation into a position where it may be utilized as fuel for the production of steam, which is used for driving the machinery necessary at these works. The finer ashes, which pass through the riddle, are useless, and have to be carted and deposited on tips. The rough material occasionally has to be supplemented with a little coal. but, generally speaking, very little coal is used. The boilers are ordinary Lancashire Galloway boilers, and they serve the double purpose of destroying the material and producing steam. The resultant clinker from these destructor boilers is ground, and after being mixed with a little lime, makes a good mortar. The concrete mortar is of very good quality. It sets as hard as bricks, and is readily sold at 4 shillings (97 cents) per ton in the depot, and is a source of profit. During the past season, as will be seen from the statement of expenditure previously referred to, we made nearly 20,000 tons of this mortar. The contents of the pail closets are emptied into chutes and pass through hexagonal rotary riddles, the object of screening it being to separate any coarse material which may have accidentally got into the pails. The liquid fæces which pass through the riddle is collected into the cisterns and thence passed into steam-jacketed cylinders, where a small proportion of sulphuric acid is added to fix the ammonia as it is generated. Inside the steam-jacketed cylinders there are beaters which revolve and assist the evaporating process. The fumes which are created are drawn off and passed through a cremator furnace and destroyed. The result of this drying process is a dry poudrette, and a ready sale is found for this article at £2.12s. ($12.65) per ton at the works, or £3 ($14,00) per ton delivered at certain railway stations. The committee produce about 8,000 tons of this manure annually.

---

[1] Transmitted to Department of Agriculture.

As regards similar refuse, viz, pail contents and also the refuse from privies, old-fashioned ash pits, etc., from the southwesterly portion of the city, this is taken to the committee's depot at Water street, and there a portion of the ashes is destroyed in destructor furnaces, of which the committee possess a variety of both old and new designs.

The clinker which results is ground into mortar, as at Holt Town, and readily disposed of. The fecal matter from the pails at this depot is not dried, but simply mixed with a proportion of fine ash, and sent away to farmers and others in the country in the committee's own boats or railway trucks.

GARBAGE.

With reference to this material, the whole of the markets within the city belong to the corporation, and the cleansing committee who undertake the removal of garbage from the markets are paid £3,000 ($14,600) per annum for this service, which includes the sweeping of the markets and the collection and disposal of the garbage.

During the past year, over 7,000 tons of this garbage was collected from the markets. It consists of waste vegetables, fruit, etc., and is collected in open carts throughout the whole day and night. Sometimes, it averages 50 tons per day during the busy season, and it is very essential that it should be expeditiously sent out of town, otherwise the pungent smell which it gives off would become offensive. It is generally taken directly to the depot and deposited in a boat, and as soon as the boat is loaded it is dispatched to the committee's own estate, which is situated about 9 miles out of the city on the banks of the Manchester ship canal. On arrival at the committee's estate this garbage is stacked and allowed to decompose, after which it is used upon the land as manure. Occasionally, farmers will take a few loads, for which they are not charged; but if this refuse is deposited near a village, complaints are generally heard with reference to the smell which emanates, and therefore it is becoming the custom to send the whole of this garbage to the committee's own estate. Before the purchase of this estate, this material was mixed with night soil and sold or given to farmers.

ANIMAL AND FISH REFUSE FROM PUBLIC AND PRIVATE MARKETS AND ABATTOIRS, PRIVATE SLAUGHTERHOUSES, ETC.

The slaughterhouse refuse from the city abattoirs and also from private slaughterhouses and the fish offal from the fish markets are collected by the cleansing committee's carts daily, and the bulk of it taken to Holt Town works, where the material is passed into the steam-jacketed cylindrical driers previously mentioned and there dried and afterwards mixed with the dry poudrette. This material is very rich in manurial constituents and considerably enhances the value of the bulk of the manure. Dead animals which are found in the city are treated in the same manner as the market and abattoir refuse. Any dead horses or cattle which the committee may have from their own depots or estates are treated in the same manner, being sent to the depot, and there the carcasses are utilized for manure. Occasionally, and almost exclusively until lately, all animal matter and fish refuse was boiled and the fat was taken therefrom and made into soap, candles, and lubricating oil, and the animal oil which the committee now use is obtained in this manner.

MISCELLANEOUS.

In the domestic refuse, a miscellaneous description of things, such as tin cans, bottles, old boots and shoes, broken glass, crockery, etc., is found. These are useless and valueless and are carted to the committee's tips and there buried. The paper and sweepings from offices and warehouses are collected in bell dust carts every morning, and are burned in the destructors along with other domestic refuse. Paper is now so largely composed of gypsum and other incombustible matter that it has very little heating properties, and retards, rather than assists, combustion; but destruction by fire is with us the most economical method of disposing of it.

GENERAL REMARKS.

Some years ago, the difficulties of finding proper outlets for night soil, street sweepings, market garbage, domestic refuse, etc., from the city were yearly increasing, and it became incumbent upon the committee to find other means of disposing of their refuse than by tipping upon the nearest vacant land. As a result of the committee's investigations, they purchased a piece of land which consisted of 1,100 acres of raw peat moss, viz, Carrington Moss, which is situated about 9 miles from Manchester. This estate required cultivating, and offered a reception ground for a vast quantity of the very refuse which the committee found so much difficulty in getting rid of. Since the acquisition of this estate, the committee have regularly sent refuse there at the rate of over 1,000 tons per week, thus not only finding an economical outlet for the material which they had to dispose of, but at the same time reclaiming a large area of waste ground and turning it into magnificent agricultural land, which has been yielding from the year of its reclamation immense and profitable crops of all kinds of vegetables and provender. As this estate is now all reclaimed and will not require so much night soil and refuse for farming operations, the committee, within the last few years, have purchased an adjacent estate of similar peat moss, viz, the Chat Moss estate, which consists of 2,600 acres of land, and it is their intention to develop this estate in a similar manner to that of Carrington. They are now in possession of two estates, which will for all time relieve them of any further anxiety as to the disposal of the rough refuse from this city. These two estates will take the whole of the refuse of Manchester, should it be found necessary.

R. D. CALLISON,
Indoor and Estates Superintendent, Cleansing Department,
Town Hall, Manchester.

SUPPLEMENTARY.

Reports from officials of the boroughs of Oldham, Holton, Stockport, and Darwen were transmitted by Consul Grinnell, of Manchester, under date of July 12, and from Burnley, under date of November 4, 1898. These reports follow:

OLDHAM.

The population of the borough is 148,288.

GARBAGE.

The garbage, which includes fish offal and vegetable matter from the shops and markets, is collected in a float cart, taken to the corporation destructor and burned. It is collected by the corporation.

Ash-pit refuse includes ashes, tin cans, broken glass and crockery, floor sweepings, etc., and is collected from the ash pits and ash cans. A portion of the ashes collected is dealt with at the destructor works, and the remainder tipped to fill up the valleys in the out districts. The cost of the collection and disposal of ash-pit refuse, excluding the destructor works, is £5,000 ($24,333) per annum.

HOUSEHOLD WASTE WATERS, ETC.

Household waste waters from the kitchen, laundry, and chambers are discharged into the public sewers, with which all the houses in the borough are directly or indirectly connected.

Respecting the removal of excrementitious matter in Oldham, from one-tenth of the habitations it is water carried; from the remaining nine-tenths it is collected and disposed of by the corporation, as follows: The excrement is collected from the sanitary pans of houses, mills, and workshops by means of tank carts, and thence carried to one of the corporation depots, one of which is situated at Bower Clough and the other at Higginshaw (two extreme ends of the borough). The depot at Bower Clough is connected with the canal, and the depot at Higginshaw with the railway. The collection taken to Bower Clough is put into large tanks and mixed with shoddy dirt. It is loaded into boats on the canal and sold to farmers in the country for fertilizing purposes. The shoddy dirt which is mixed with the excrement is cotton dirt that is left after the cotton has been willowed at the mills. It is quite dry and granular. The collection taken to Higginshaw is mixed with shoddy dirt, loaded into railway wagons, and sold to farmers. The object of mixing the shoddy dirt with the excrement is to absorb all the moisture, and thus make it salable and carriageable, and fit to spread on the land. There are no ashes in the excrement collected.

During the last two years the corporation have encouraged the adoption of the water carriage system. We have now 1,562 water-closets, 872 waste-water closets, and 206 trough closets in the borough.

WATER-CARRIED SEWAGE.

The combined sewer system is in use and the sewage reaches the sewage works by natural gravitation through the sewers. The sewage works, etc., are the property of the corporation and are carried on at their expense and under their control. The sewage, on arrival at the works, is treated with a solution of lime and copperas, the coarser particles, such as paper, sticks, etc., being intercepted by a screen. The treated sewage then flows through the settling tanks at a very slow rate, the solid particles settling to the bottom of the tank and the clear fluid flowing over the lower edge of the tank into the effluent channel. The sludge from the bottom of the tank flows into a channel, from which it is forced by means of compressed air into the sludge presses. The fluid forced out of the presses returns into the sewage and is re-treated. The compressed sludge or cake is purchased by the surrounding farmers for applying to grass land, and is also being used to fill up a valley in the neighborhood of the works. The tank effluent is run into bacteria beds or filters. The filter or bed consists of screened ashes to the average depth of 2 feet 3 inches, with a channel on the surface for conveying the tank effluent into the filter bed, and a field or pipe drain on the floor of the filter to convey the filtered sewage to the outlet. The filters are in turn filled with the tank effluent, and when full are allowed to rest for a period varying from two hours upward. The fluid is then allowed to flow out of the beds, and they are allowed to rest some hours. As a rule, when working properly, the beds are filled twice in the twenty-four hours.

An analysis of the sewage—tank effluent and the effluents from the various filter beds—is conducted each day except Saturday and Sunday. The tests applied are: (*a*) The amount of oxygen consumed in four hours in the various samples; (*b*) the amount of ammonia; (*c*) the amount of albuminoid ammonia, and (*d*) occasionally the amount of nitrites in the filter effluents. Specimens of the filter and tank effluents are also incubated for a period of five days to test the liability to decomposition.

Some of the filter beds have been in use about six months and are doing their work most satisfactorily. Others have been in use only a short time and have not yet reached their full working power of purification. The area of the settling tanks is 1¼ acres. The area of the filter beds is 3 acres 948 square yards. The cost of the construction of works, plant, settling tanks, presses, and machinery was £29,312 ($142,647). The cost of land for sewage treatment and construction of bacteria filter was £55,300 ($269,117). One shilling per load is obtained for the sludge cake sold to farmers. As the works are not yet dealing with the whole of the sewage of the borough, the cost of working the plant can not be given.

VOLUME OF SEWAGE TREATED.

The average volume of sewage at present treated is about 1,500,000 gallons per 24 hours. When the whole of the borough is coupled up, there will be a dry-weather volume of 5,250,000 gallons per 24 hours. The works are, however, designed to treat a much greater amount than this, allowance having been made for the future growth of the borough.

STREET SWEEPINGS.

The total mileage of streets within the municipal area of Oldham is 81 miles. All of the streets are paved with granite or local grit setts, grouted with pitch. The footpaths are paved with flags 3 inches thick, from the stone quarries in the county. The main thoroughfares are swept with machine brushes every night, and gangs of day orderlies are kept at work, sweeping and picking up, during the daytime. The whole of the street sweepings is collected in open carts and deposited at the tips. No special use is made of the sweepings, nor do we make them into a marketable manure. The total cost of the collection, removal, and disposal of street sweepings is £4,130 ($20,099) per annum. The whole of the work under this head is done by the corporation.

FACTORY AND MARKET WASTES.

There are no manufacturing establishments in this borough furnishing waste products of agricultural or sanitary interest. The garbage from the markets and shops, also the fish offal, are collected in carts, taken to the destructor, and burned. The butchers' offal is collected from the slaughterhouses and disposed of in the same manner as human excreta.

Dead animals are conveyed to the destructor and burned. There is no cost, neither is there any profit, to the corporation under this head.

Description of destructor.—The destructor, which contains 10 cells, was built by the Horsfall Syndicate, Limited, of Leeds. Six cells were erected in 1891, in one series, and 4 in 1895, in another, the whole having steam blast. The waste heat from the 6 furnaces is passed through a Lancashire steam boiler 30 feet long and 8 feet in diameter, raising steam at a pressure of 120 to 140 pounds, which is used for supplementing the power at the corporation electric lighting station for mortar grinding and for driving machinery at the corporation workshops. It was found that there was sufficient heat for another boiler, which has recently been put down. This boiler is now supplying steam to the electric lighting station at 120 pounds pressure from the 4 cells only, in addition to the steam supplied from the 6 cells named. The heat is supplied entirely from the refuse collected, the temperature in the main flues being from 1,800° to 2,000° F. The said refuse consists of wet ashes from exposed ash pits and ash cans, fish offal, and market garbage. The furnaces work regularly the whole twenty-four hours to our entire satisfaction. The chimney is 120 feet high. The works are situated in the center of the town and in close proximity to houses. There is no nuisance whatever. The cost of repairs to the furnaces is approximately £90 ($438) per annum. The stokers work in shifts of eight hours each for the whole twenty-four hours, and are paid at the rate of 30s. ($7.30) per week. The average consumption last year was 8 tons 2 hundredweight per cell per day of twenty-four hours. The cost of burning, after deducting receipts for mortar, is 1s. 1¼d. (26.8 cents) per ton (laborer only 9¾d. —19.7 cents—per ton). A portion of the clinker is ground up for mortar and sold at 5s. ($1.22) per ton, for which we have a good demand. The remainder of the clinker is carted to valleys and on waste land. The annual cost of working and maintaining the destructor is about £1,300 ($6,326.45).

Report of night soil and ashes departments, 1897.

Sanitary pans in the borough	23,885
Iron tanks, cesspools, etc., in the borough	42
Water-closets in the borough	1,536
Waste-water closets in the borough	793
Trough closets in the borough	206
Ash pits in the borough	10,443
Places with ash cans, etc., in the borough	1,455
Houses represented	31,483
Mills, workshops, etc., represented	537
Churches, schools, etc., represented	193

NIGHT SOIL DEPARTMENT.

Sanitary pans emptied during the night	1,252,280
Cesspools emptied during the night	115
Slaughterhouses from which butchers' offal has been removed during the night	4,790
Fish shops, etc., from which fish offal has been removed during the day	13,719
Loads of excreta collected	13,436
Loads of butchers' offal collected	662
Loads of fish offal collected	681
Loads of shoddy dirt collected	5,871
Tons of manure sent out from Higginshaw	15,833
Tons of manure sent out from Bower Clough	7,128
Total tons sent out	22,961

ASHES DEPARTMENT.

Ash pits emptied during the day	58,052
Other places collected during the day	69,887
Loads of ashes taken to destructor	16,212
Loads of ashes taken to corporation tips	13,246
Loads of ashes taken elsewhere	6,936
Loads of clinkers removed	5,232
Total loads removed	41,626

DESTRUCTOR.

Quantity of ashes, fish offal, and garbage consumed at the destructor.	tons	18,699
	cwt	7
Average per furnace per day of 24 hours	tons	8
	cwt	2
Quantity of mortar sold	tons	1,155

BOLTON.

The population numbers about 120,000.

All the scavenging and sewage operations of Bolton are carried on by workmen employed by the mayor and council. There are no contractors. When the collection has been carted into our depots, it is roughly divided into manurial and nonmanurial portions. The manurial portion (excreta, animal offal, vegetable, etc., garbage, street sweepings, and filthy ashes) we grind together in mills, with the result of transforming an unsightly mess into apparently rather soft mud, which soon drains itself clear of superfluous liquid, thereby becoming a portable ground manure, in appearance resembling a dark garden earth and with little or no smell. The superfluous liquid from this ground manure flows to our sewage works, of which more anon. The value of Bolton ground manure as gauged by Lancashire farmers is best answered by the fact that at the present time, there is very little town manure in stock at any of our scavenging depots.

The nonmanurial portion (dry ashes, cinders, glass, and pottery, worn-out household furnishings, miscellaneous litter, such as paper, straw, etc.) we incinerate in special furnaces, getting in the process power enough to run ten grinding mills and work a railway wagon-shunting capstan, etc., besides getting a specially excellent clinker for mortar making, while as for the residuum (tins, stones, dust, etc.), all has been cleaned by the incineration, and therefore can be used to level up any hollow places without creating in the neighborhood the slightest nuisance.

Up to the present, we have not sold any specialty collected. We pass annually through our destructors thousands of tins which have been made and used for the canning of all kinds of food, but for which we have been unable to find a market, while as for any unbroken bottles which we may collect, the scavenging and sewage committee do not approve of their further circulation, and therefore ground manure and ground mortar are our only salable products. And now to summarize the weight of our collection and the costs incurred for collecting and disposing of it.

WEIGHT.

In the year 1897, we collected 51,451½ tons of refuse from the closets and household fires, at a cost of £6,319 9d. ($30,752); 9,984½ tons of refuse from the streets and markets, at a cost of £4,705 18s. 5d. ($22,901); 1,281 tons of refuse from the public and private abattoirs, at a cost of £170 2d. ($827); 1,273½ tons of refuse from the dust and litter bins from lock up shops, at a cost of £162 13s. 2d. ($792). Total collection, 63,990½ tons, at a total cost of £11,357 12s. 6d. ($55,262).

DISPOSAL.

Sold to farmers, 18,656 tons; chiefly incombustible refuse, such as street detritus, tipped away, 6,718 tons; incinerated in our destructors, 33,963¾ tons; surplus liquid drained out of the depots into our sewage works, 4,652¾ tons; total, 63,990½ tons.

UTILIZATION.

	Tons.	Cost. English money. £.	s.	d.	Cost. United States money.
Incinerated	33,963¾	1,239	4	8	$6,031
Mortar made	12,979	1,915	5	3	9,321
Manure sold	18,656	1,336	3	3	6,502
Expenditure	....	4,490	13	2	21,854
Destructor clinkers were used in mortar making, which sold for £. 3,275 s. 5 d. 5 =	$15,939				
Manure sold for £. 799 s. 3 d. 4 =	3,889				
		4,074	8	9	19,828
Net loss on the disposal		416	4	5	2,026
Net cost of the collection		11,357	12	6	55,272
Net cost of scavenging Bolton in 1897		11,773	16	11	57,297

The foregoing costs include all the wages paid, horses' provender eaten, depreciation of value of horses and vehicles (12 per cent per annum), tools required, lime and water used in mortar making; in short, all costs except such "capital account" charges as the interest due upon the value of our depots, sites, buildings, and machinery.

METHOD OF TREATMENT AT SEWAGE WORKS.

We have tanks with about 4,500,000 gallons of contents which, now that our system of intercepting sewers is complete, may be taken as our normal twenty-four hours' flow, and our method of treatment has been, since 1873, and is now, precipitation, the chief precipitant being Buxton lime (a soft, white, diffusive lime), to which we add the ground cinders from incinerated garbage (carbon) and more or less of alumino ferric (the commercial name of a local acid precipitant); but latterly, the effluent thus obtained has not been found sufficiently pure to reach the local government board standard, and therefore the mayor and council of Bolton have bought an estate of nearly 200 imperial acres, which is fast being laid out as a sewage-filtration farm. This estate is about 5 miles farther down the river Irwell than our precipitation tanks, with which it is connected by a conduit, whereby the precipitation effluent of the tanks will flow through the prepared filtration plots of the farm before it is allowed to pass finally away into the river.

DISPOSAL OF SEWAGE SLUDGE.

This is a growing difficulty, which aforetime we have met by drying it into a cartable consistency and then giving it away to local farmers, with a small money bonus for every cartload. We have also used it as one of the constituents of our ground manure, but the local markets are getting glutted and sewage mud is rather glutinous for grinding; therefore, incineration in specially constructed furnaces is the evident permanent remedy, as the incombustible residuum, about one-third of the original bulk, can then be tipped away without giving offense to anybody. At present, we burn what we can in the sewage works furnace, where it smolders fast away, but to keep up steam we have to mix it with small coal; just as in a destructor, it would be well to mix it with ash-pit refuse to obtain a quicker combustion.

JOHN STEWART,
Superintendent of Scavenging and Sewage, County Borough of Bolton.

JUNE 20, 1898.

STOCKPORT.

The population (estimated to middle of 1898) is 81,500.

GARBAGE.

As regards about two-thirds of the total number of houses in Stockport, such refuse is deposited in common privy pits (which in 1897 numbered 9,486), situated a few yards from the houses, and is removed and deposited on tips, at periods varying from two or three to six or even twelve months, according to the size of the privy pit. In houses supplied with water-closets (which exist to the number of about 4,500) domestic refuse of all kinds, except excremental, is deposited in dry ash pits situated at the rear of the houses, which are emptied as soon as they become full, which of course varies with the size of the pit. During the last three years, metal dust bins of an approved type have been provided instead of ash pits, and these are emptied weekly, and are of course a very great improvement on the ash-pit system. The whole work of scavenging is undertaken by the corporation. The night-soil department, consisting of 42 men and 13 horses and carts, working between the hours of 9 p. m. and 6 a. m., deal with the scavenging of the common privy pits, and during the year 1897, 21,239 loads of refuse were removed from 7,368 privy pits. The day scavenging department, consisting of 68 men and 16 horses and carts, working between the hours of 5 a. m. and 3.30 p. m., cleanse the dry ash pits and empty the metal dust bins, besides sweeping, cindering, sanding, and watering the streets as occasion may require. During the year 1897, 7,299 loads of refuse were removed from 3,316 dry ash pits; 8,052 loads of sweepings were removed from the streets; 322 loads of cinders, 482 loads of sand, and 2,242 tanks of water were put upon the streets. The total cost of the night-soil department during 1897 was £5,464 5s. 3d. ($26,592), and the cost of the day scavenging department for the same period was £4,043 10s. 9d. ($19,678). No attempt is made by the corporation to sort or utilize paper and refuse thus collected and deposited on the tips.

HOUSEHOLD WASTE WATERS.

All houses in the borough, with very few exceptions in the newest parts of the town, where sewers have not been provided, are connected with the public sewer. In the exceptional cases referred to, the waste waters find their way into cesspools or water courses.

WATER-CARRIED SEWAGE.

At present, all the sewage is discharged into the river Mersey untreated, but a sum of £150,000 ($729,975) has been spent on intercepting sewers and sewage works, which are approaching completion. Chemical precipitation, followed by land filtration, is the method of treatment which it is proposed to adopt. The sewage farm belongs to the corporation, and comprises 95 acres of land, of which it is proposed to gradually appropriate 63 acres for sewage purification. The population of the county borough is 81,500, so that the relation between the population and the filtering area is about three-fourths of an acre to each 1,000 of population.

STREET SWEEPINGS.

The collection, removal, and disposal of street sweepings have already been dealt with. The pavements consist chiefly of Welsh, Derbyshire, and granite sets, and only a few of the roads are macadamized.

FACTORY WASTES.

There are within the county borough many hat factories, bleach works, and dye works, all of which furnish waste products of sanitary interest, inasmuch as the chemical effluents therefrom can not but have an unfavorable effect on the bacterial purification of sewage at the outfall works. The only official regulations at present in force in regard to the wastes from factories are the provisions of the public health act of 1875, and the public health acts (amendment) of 1890, which forbid the creation of a nuisance or the causation of damage to sewers.

MARKET AND ABATTOIR REFUSE.

This is buried at a tip outside the borough. Such refuse, if created by private individuals, e. g., butchers or fishmongers, has to be conveyed to the tip by the owners.

Dead horses and cattle are dealt with by a private firm of knackers; other animals are buried at a tip. There are no municipal methods in use for the utilization of carcasses of dead animals.

CHARLES PORTER, M. D., D. P. H. Camb.,
Medical Officer of Health.
GILES ATHERTON,
Mayor of County Borough of Stockport.

DARWEN.

The population numbers 40,000. From 35 to 40 tons of ashes, garbage, etc., are collected each day, and the work is carried on by the corporation's own staff, at a cost of about 3s. (72 cents) per ton. The refuse has been tipped in convenient hollows or natural holes or quarries on the outskirts of the town, but this has now been abandoned and a refuse destructor for disposing of all the waste noxious material of the town by fire is now being erected. We do not sort the material in any way, but propose to use everything as fuel for the generation of steam by the destructor, for the production of electrical energy for tramways and electric lighting.

All waste water is conveyed to the sewage-disposal works, and we have no houses, except very isolated dwellings, which are not connected by drains with the main sewerage system.

There are 7,000 pail closets in the borough, which are emptied weekly at an annual cost of about 3s. 6d. (85 cents) per closet per annum. This was formerly conveyed to the meadow land adjoining the town and used for manurial purposes; but being found to be the cause of several cases of typhoid, this has been discontinued, and the sewage is emptied into the main sewers at convenient places.

The sewerage system is practically on the combined system; but, wherever practical, new streets are drained on the separate system. The sewage gravitates to the disposal works recently erected at a cost of about £35,000 ($170,328), where the treatment is carried on by means of chemical precipitation and artificial filtration. The cost of working the system is about £1,200 ($5,840) per annum, exclusive of interest and sinking fund. The volume of sewage varies from 600,000 gallons per day in dry weather to 3,000,000 gallons per day in wet weather.

Street sweeping is carried on by the corporation and the material collected is disposed of at the various tips. Factories and all trading establishments have to purify their own waste products at their own expense.

Market and abattoir refuse and dead animals are consumed in the refuse destructor.

R. W. SMITH SAVILLE,
Borough Engineer.

BURNLEY.

Area, 4,015 acres; population, 102,000 (estimated).

GARBAGE.

The material collected consists principally of the waste from coal, coke, animal and vegetable foods, paper, sawdust, floor sweepings, and household usables, as pots, glass, tins, etc., and is known as household refuse. The weight of the above class of refuse is 25,287 loads, or about 19,000 tons. The system adopted is, briefly: Each dwelling house is provided with a stone or brick built receptacle known as an ash pit. Such pit is provided with an opening, about 4 feet from the ground level, through which ashes, etc., are thrown; also with another opening, guarded by a door and on the ground level, from which the refuse is emptied by the corporation scavengers. This waste is lifted from the ground into carts, each holding on an average about 15 hundredweight; then taken, if innocuous, to tips, or, if noxious, to the refuse destructor. The total cost of collection and removal of the above household refuse amounts to £2,350 ($11,436) per annum. The corporations, do not do the whole of this work themselves, nearly two-thirds being done under special contract terms.

The cost and manner of final disposal varies considerably. If this refuse is sent to tips, it is merely laid in a hollow or valley, and, owing to heating and combustion, speedily settles and forms what is known as "made or artificial ground," and after a few years is allowed to be used for building purposes. If to the refuse destructor, the cost is considerable. As the new destructor was only opened at the end of April, 1898, it is impossible to give a fair statement of the cost of working, but it approximates 2s. (48.6 cents) per ton of material burned. In this process, the fouler portions of the household refuse are burned, no use being made as yet of the heat generated, and the waste collected is in no way sorted, except the larger iron or tin wares, which are sent away to chemical works at Leeds. The ashes, clinkers, dust, etc., left on cremation are carted away to tips at a cost of about 1s. (24.3 cents) per ton, or about £120 ($584) per annum. The destructor belongs to the corporation, and the whole cost of working is defrayed from the rates.

We have no systematic methods in use for the collection and utilization of tin cans, bottles, broken glass and crockery, ashes, sawdust, floor sweepings, grease, paper, and other coarse rubbish.

HOUSEHOLD WASTE WATERS FROM THE KITCHEN, LAUNDRY, AND CHAMBERS.

The above waste waters pass direct through the house connections to the public sewer systems. About 98 per cent of the houses are provided with sewer connections for this purpose. The remaining 2 per cent empty into cess pits or settling tanks. The contents of the cess pits or settling tanks are emptied periodically and used for agricultural purposes in the vicinity of the town.

EXCREMENTITIOUS MATTER NOT WATER CARRIED.

The proportion of habitations provided with water-carriage closets is 95 per cent, and in the remaining 5 per cent earthenware cess pits and galvanized iron pails are used, the excrementitious matter being principally used as a manure on land in the outlying portions of the borough. No manipulation whatever takes place except dilution with water.

WATER-CARRIED SEWAGE.

A historical and detailed description of the sewage-disposal works, by Mr. F. S. Button, M. Inst. S. E., the late borough surveyor, is sent herewith.[1]

STREET SWEEPINGS.

The methods in use are machine sweeping and hand sweeping. In machine-sweeping, machines of our own modeling are used, are provided with revolving brushes actuated by the axle which is fixed to one of the large wheels of the machine. The brushes are set at an angle more or less acute, according to circumstances, and the dirt, etc., is brushed or swept into the street channel. The dirt is next brushed by hand into heaps and lifted direct into carts. In hand brushing, the men use long-handled brushes and sweep the dirt from the center of the street into each channel, where it is further brushed into heaps and lifted into carts. These carts are then taken to a depot, farmers' yards, and market gardens. The portion carried to the depot is collected from the central streets twice daily, and contains a larger proportion of horse manure. This material is then sold to farmers at about 6d. (12 cents) per ton. The other portions are carted direct to suitably selected spots belonging to farmers and market gardeners. The whole of this work is done by the corporation, with hired horses. The cost of collection and removal is about £3,250 ($15,816) per annum. The whole of the roadways above mentioned are paved with granite or sandstone setts.

FACTORY WASTES, SOLID AND LIQUID.

Much of the clinker and ashes from the furnaces is used for making mortar for building purposes. The waste cotton and sweepings from the cotton mills which can not be sold for commercial purposes are used for bedding cattle at some farms. Being of an absorbent character, it retains the excrementitious matter from cattle. After lying in a heap for some little time, it is used as manure upon the land.

MARKET AND ABATTOIR REFUSE.

Eighty per cent of the market refuse is carted to the destructor and there burned. The remaining portion is taken to farms and market gardens, where it is mixed with the compost heaps and afterwards used as manure. A farmer in the outlying district of the borough is paid a small amount by the corporation to cart away the more solid portions of the abattoir refuse to his farm. It is used as manure upon the rough land.

---

[1] Transmitted to Department of Agriculture.

DEAD ANIMALS.

The methods in use for their disposal are sale to knackers and cremation at the destructor. The cost to the corporation for those cremated is small, say £50 ($243) per annum, and this includes collection, removal, and disposal. There is no profit. By far the larger proportion of carcasses are bought by knackers.

WM. T. TULLALOVE, *Town Clerk.*

NEWCASTLE-ON-TYNE.

Newcastle-on-Tyne has an area of 5,371 acres. The present officially estimated population is 223,000.

GARBAGE.

In addition to animal and vegetable foods, this comprises ashes, paper, straw, tins, household waste, scraps of all kinds, and some excreta. About 125,000 tons per annum are collected by cart from houses and streets, at a cost of $131,406, the work being done by the municipality. About one-fourth is burned, one-fourth sent to sea, one-fifth sent by rail as manure to farmers, and the remainder dumped where ground can be hired to fill up. A 12-cell destructor, owned and operated by the town, is used. The value of products is practically nil, say $120 per annum.

Various plans have been tried for utilizing the materials collected, but in all cases, the cost of separating and collecting has exceeded the value recovered.

HOUSEHOLD WASTE WATERS.

All houses are connected with sewers. The water-closet system is in use in five-sixths of the houses, and in the remainder either privy pans or privy ash pits are employed, the contents of these being collected at night and sent out of town by rail as manure. The sewage goes to the river, which is tidal for 6 miles above the city. No system of purification is in use. Pumps are not employed. There are no sewage farms and the sewage receives no treatment.

STREET SWEEPINGS, ETC.

Street sweepings are included in refuse, and are dealt with, at a cost of $64,000 per annum, by the municipality.

Market and abattoir refuse is collected and dealt with as manure, or burned.

Dead animals are sent to private manure works and boiled down, or otherwise dealt with, at city's cost. Dead animals found in the river are, after disinfection, taken out to sea by the river Tyne commissioners' hoppers.

The following memorandum is by the medical officer of health for the Northumberland County council:

> There are practically no manufactories away from the Tyne. The northern parts of this county are agricultural and thinly populated. The southern parts are, to a great extent, collieries and villages. Generally speaking, the sewage finds its way, untreated, into the nearest water course, and in colliery and agricultural villages the old-fashioned privy midden, emptied in the former case by the owners and in the latter case by farmers, is the favorite method of refuse and excrement disposal. Where the water-carriage system is adopted it is the "combined," not "separate." In some few cases irrigation is practiced, preceded by subsidence in ordinary settling tanks, the sludge being easily sold at 25 cents per load. These irrigation grounds are generally let for a nominal sum and sometimes for nothing. The crops grown are chiefly market-garden produce, carrots, greens, rhubarb, etc. The land is always underdrained. Just now, steps are being taken in several directions toward treating sewage in bacteria beds on the septic and Dibdin's systems, but none of these departures are complete at this time.

I inclose herewith the following pamphlets,[1] etc., relating to the subject: (1) Refuse Burning, by W. George Laws, C. E.; (2) Report of the City Engineer of Newcastle for the Year ending March 25, 1896; (3) Report of the City Engineer of Newcastle for the Year ending March 25, 1896; (4) Report on Septic-Tank System of Sewage Treatment; (5) The Septic-Tank System and Sewage Treatment; (6) The Septic-Tank System and Sewage Treatment; (7) Some Recent Experiments in Sewage Treatment at Exeter; (8) The Utilization of Micro-Organisms in the Purification of Sewage; (9) Report on the Septic-Tank Process of Sewage Treatment; (10 The Purification of Sewage; (11) The Septic-Tank System of Sewage Disposal.

HORACE W. METCALF, *Consul.*

NEWCASTLE-ON-TYNE, *April 28, 1898.*

NOTTINGHAM.

Engineer of Nottingham, also that of the borough engineer of Leicester as follows:

Consul Dickinson sends from Nottingham, April 18, 1898, reports of the city.

REPORT OF CITY ENGINEER OF NOTTINGHAM.

GARBAGE.

The word garbage is understood to mean the dry ashes and refuse from houses, together with the waste of animal and vegetable foods, but not including any excreta. The amount collected is about 14,000 tons per annum. The cost of this collection can not be given, as it is included in the cost of the collection of the pails containing excreta. The whole of this collection is done by the staff of the city, and not by contract. This material is finally disposed of by being burned in a destructor. This method has been in use about fifteen years. The plant is owned by the city, but there is no commercial value in the products except the clinker, which is used for ballast in forming new main roads.

---

[1] Transmitted to Department of Agriculture.

TIN CANS, BOTTLES, BROKEN GLASS, ETC.

The solder is removed from tin cans, etc., by means of Swaine & Harrison's patent furnace for recovering solder; the whole of the other portions of refuse, such as bottles, crockery, paper, etc., passes through the destructor. The destructor at present in use was made by Messrs. Manlove, Alliott & Co., of Nottingham, and is practically out of date. The corporation are considering a scheme for pulling down the destructor and building a set of destructors consisting of twelve cells, which, it is expected, will realize steam to the amount of 300 to 400 horsepower, to be used for various purposes, principally for providing power for electric lighting in the neighborhood.

HOUSEHOLD WASTE WATERS.

Practically speaking, there is a connection from every house to the public sewer, the only exception being where there are a number of back-to-back houses in closely built districts which are not provided with sinks. In these cases, the waste waters are thrown down the gulleys in the channels of the adjoining courts or yards. Cesspools are not permitted in this city, except in very exceptional circumstances, such as when building operations in a district are being carried on in advance of the sewage system. For instance, at the present time there is a district in the city where 600 or 700 houses have been built. The district being too low to admit of the sewage being delivered into the existing system of sewers, a new intercepting sewer is being put in as rapidly as possible to drain this district.

EXCREMENTITIOUS MATTER.

The system known as the pail-closet system has been largely adopted in this city, and at the present time, there are about 40,000 pails and about 10,000 water-closets. The extension of the pail system is being abandoned and the water-carried system adopted in its place. The conversion, however, of the pail system into the water-carried system will be a slow process, extending over a number of years. The system known as the waste-water system has been partially adopted as an experiment. This closet is one supplied with a hopper similar to an ordinary water-closet, with a siphon trap at the bottom, and at the side of same is a tipper holding about 3 or 4 gallons of water. This tipper is charged with the waste water used for domestic purposes in the house. The objection to this system is that the hopper has no rim flush, and therefore in time it becomes foul and requires cleansing by hand labor. The contents of the pails, which amount to about 60,000 tons per annum, are roughly screened at the various depots and are then forwarded to the agricultural districts in the neighborhood either by rail or boat. The objection to this system is that in times of very severe frosts, an enormous accumulation of manure takes place, which is liable to become a nuisance in the neighborhood of the depot.

WATER-CARRIED SEWAGE.

The whole of the sewage of the city, which amounts to about 7,000,000 gallons per day (dry-weather flow), is dealt with on a sewage farm. The combined system of sewers is used in this city. A separate system was tried in certain districts, but it was found in course of time that the sewers carrying sewage proper became very foul, in consequence of not having sufficient rain water discharged into them to keep them clean. About 2,500,000 gallons of sewage at the higher levels gravitates onto the sewage farm, and the remainder, about 4,500,000 gallons per day, has to be pumped. The amount of lift is small, being only about 15 feet. The cost of the pumping station, including two cottages, pumping machinery, etc., was about £18,750 ($91,247). The cost of pumping the sewage, including all charges, is about

£850 ($4,137) per annum. The sewage from certain districts outside the boundaries of the city is dealt with by the city council, upon terms arranged between the authorities, so that the total population contributing to the sewage farm is 260,000. The sewage farm is situated about 6 miles from the city and consists of meadow lands, with a subsoil composed of light sand and gravel. The system adopted is that of broad irrigation, with downward filtration. This system has been in operation for upward of twenty years. The area of the sewage farm is about 900 acres, of which about 660 acres is closely underdrained and prepared for receiving sewage, and the remainder is occupied by farm buildings and permanent pasture. The crops grown consist of wheat, oats, barley, clover, rye grass, mangold, potatoes, cabbage, swedes, kale, kohl-rabi, etc.

The income from the sale of farm produce, stock, etc., is about £7,000 ($34,066) per annum. The system adopted on the farm is that of keeping sufficient stock to eat the bulk of the produce grown upon the farm. A large quantity of milk is sold and also a great quantity of butter. The stock are fattened and an annual sale is held.

The sewage is not treated in any way before it reaches the farm. A portion of the farm, consisting of 120 acres, is laid out for intermittent filtration. The filters are, however, of natural construction, consisting of sand and gravel. This land is divided into four parts and is used alternately. The sewage is not treated in any way before it reaches the filters.

The city council have just decided to double the area of the farm in order to provide for the increased amount of sewage.

The total amount which has been expended on freehold land is £40,000 ($194,660), and the remainder of the land is held on lease, which expires in about forty years. A rental of £5 ($24.30) per acre per annum is paid.

STREET SWEEPINGS.

The collection and removal of street sweepings, etc., is undertaken by the staff of the city council and not by contract. The work is done principally between midnight and 8 o'clock in the morning. The sweepings from the busiest thoroughfares are sold at 1s. (24 cents) per load of 27 hundredweight. The cost of this work, including the emptying of gulleys, etc., is about £7,000 ($34,066) per annum.

FACTORY WASTES, SOLID AND LIQUID.

There are a number of manufacturing establishments in the city, and they are permitted to discharge their waste waters into the public sewers, provided they fulfill the conditions laid down in a local act of Parliament obtained in the year 1872, which makes it unlawful for any person to discharge refuse into the sewers which would be injurious to them and cause them to silt up, or which would be injurious to vegetation or interfere with the utilization of the sewage. This entails upon the manufacturer the responsibility of separating to a certain extent the solids from the liquids before he discharges his waste products into the sewers.

The refuse from the markets and abattoirs is burned in the destructors.

The horses, etc., which are killed as being unfit for use are burned in the destructors. The horse slaughterhouse is the property of the corporation, and is rented by a private individual. The corporation do not derive any profit from the carcasses of the animals.

ARTHUR BROWN, *City Engineer.*

REPORT OF BOROUGH ENGINEER OF LEICESTER.

The population of Leicester is about 206,000. The sewage from about 190,000 of this population goes to the farm. The normal flow of sewage varies, according to the period of the year, from 6,000,000 to 7,000,000 gallons per day; of course, it is larger during heavy rains. The sewage is conveyed by intercepting sewers to a pumping station in the lowest part of the town. At this place, it is simply passed through rough and fine screens without any precipitation tanks. We are about to construct small detritus tanks to intercept the road detritus. From this point, it is pumped for a distance of 1½ miles through two 33-inch rising mains onto the watershed of a sewage farm, and delivered at an elevation (including friction) of about 170 feet above the pumps. The total area of the farm is 1,700 acres, about 1,350 of which are available for sewaging. The remainder is used for grazing the cattle, in order to relieve the farm in wet seasons of the year. With the exception of about 20 or 30 acres, the subsoil of the farm is blue bowlder clay of almost unknown depth. Upon this are about 2 feet 6 inches of yellow clay, and when we commenced to work it the top soil was only about 6 inches thick; but by continual working and introducing sludge into the clay we are getting a greater depth each year, up to perhaps 16 inches. The system is not intermittent filtration, but broad irrigation.

The general impression was that this farm would be an utter failure in consequence of the clayey nature of the soil, and this prophecy would no doubt have been realized were it not for the method in which it has been laid out and the resolute manner in which it has been managed. The underdrainage is one of the greatest factors in the success of the farm. It was absolutely necessary to drain this land, and if this had been done in the ordinary way the sewage would have reached the drains and ultimately the streams in a foul condition, as there were only about 6 inches of soil to filter through. As the farm sloped each way from the central ridge or watershed, instead of having a system of drains connected with master drains and these running into water courses, each field had its own separate system.

Along the bottom of each field was laid a master drain, falling to the lowest corner thereof, which intercepted all the branch drains from the corner of the field. The master drain was run out as quickly as possible onto the surface of the next field, or onto the next but one, if the slope was not very steep. By this means, the foul effluent reaching the drains could be brought to the surface again and sent over one or two other fields, as might be necessary, until properly purified. The drains average 4 feet in depth, and are laid about half a chain apart. The surface water is also sent over two or three plots before being fit to be sent away.

About one-third of this land is arable and the remainder old pasture. It has been the practice to send the sewage first over the arable land and then over the pasture to finish it off.

We keep a large number of stock on the farm. Last year we had 1,079 bullocks, and there are at least 150 to 160 horses. The bullocks sell readily, either in our local or the London markets. The majority are Welsh bred. The corporation horses are under the control of the farm committee, and all the hay that can be grown on the farm is used to feed them. They do remarkably well upon it; in fact, the chairman thinks there is something peculiar about it, as it suits the animals so well. The bullocks are fed upon nothing but the grass grown on the farm, excepting just at the end of the season, when we desire to dispose of them, they are given a little oil cake.

In the summer time, we have sometimes as many as 150 people working on the farm, and there are several cottages which are occupied by workmen all the year round. We have had no cause to think it has been detrimental to their health. The farm abuts onto a village having a population of about 2,000.

We have some very large cattle sheds to put the beasts in during very wet weather, and more particularly in the winter season to keep the bullocks off the land, as they do great damage in winter. The sheds are constructed with low walls and wooden roofs, in a very simple but effective way. The beasts can go straight out in the spring without losing their coats, as they get plenty of ventilation.

The total capital outlay on the farm, exclusive of raising mains, is £57,391 11s. 5d. ($279,296). The net loss on the farm for the year ending March, 1897, was £8,721 ($42,441), including rent, but not repayment of principal and interest on capital expenditures. This equals a rate of 11.31d. (22.9 cents) per head of population draining onto the farm.

HOUSE REFUSE DISPOSAL, ETC.

The house refuse, garbage, etc., are all collected by the corporation and conveyed to three 6-cell refuse destructors at different centers of the borough. About 50,000 tons per annum are collected. About 40,000 tons per annum are burned at the destructors, and the remainder is utilized for mixing with the excreta, which is at present collected from about 6,000 pail closets, and this mixed material is sold to farmers in the neighborhood. A provisional order has, however, been obtained for the abolition of these pail closets and a substitution of water-closets.

When this work of abolition is completed, the remainder of the house refuse will be burned in two additional refuse destructors which are to be provided.

Residue in the shape of clinkers, etc., from the burning of this refuse is ground up and sold for making mortar, concrete, and street-paving blocks.

Steam is generated by the waste heat and utilized for grinding purposes, and in some cases, sold to adjoining firms as a motive power, and a scheme has been prepared for the further utilization of the waste heat.

STREET CLEANSING, ETC.

Streets are cleansed and watered by the corporation, and the sweepings sold to farmers, market gardeners, and allottees for manuring the land.

E. George Mawbey,
Borough Engineer and Surveyor.

PLYMOUTH.

As the same methods for the collection, removal, and final disposal of waste materials obtain in all of the several cities of this district, an examination of the devices employed at Plymouth will give a fair conception of the operation of the system as a whole.

Plymouth is most conveniently situated for the economic maintenance of a large sewer system. Built on a gentle declivity sloping to the sea, nearly all her sewers empty into that body of water. A few small sewers in the northeast part of the city, however, discharge into settling tanks, which empty into sludge wells. The matter is treated chemically, and finally pumped up and buried in an adjacent farm. The cost of maintaining this small plant is about $1,000 per annum. The combined sewer system is in use, and all houses must be connected therewith.

Careful attention has been devoted to the best methods for the collection, removal, and final disposal of garbage and street sweepings.

From 13,000 houses in the city 26,000 tons of refuse are collected and disposed of annually. The work is done by contract. The matter collected contains, in addition to the waste of animal and vegetable foods, ashes, dust, paper, garden refuse, cinders, soot, coal, coke, glass, etc. The collection is made by carts, calling at warehouses and manufacturing establishments daily and at private residences twice a week. The collection costs 90 cents per ton, and disposal thereof 32 cents. The paper is burned and the remainder barged to sea.

The work of cleaning 70 miles of streets and the adjacent sidewalks is performed both by the corporation and by contract. The horse-and-cart work for collection and removal is done by contract, while the hand-broom work is performed by corporation men. No refuse of any kind or water is allowed to collect, and the streets are sprinkled and brushed nightly. The cost of collecting the waste is $21,890 per annum, and the disposal of the same $7,786. None of the matter can be sold, and what the farmers will not accept is, like the garbage collected from houses, barged to sea.

JOSEPH G. STEPHENS, *Consul.*

PLYMOUTH, *March 11, 1898.*

SHEFFIELD.

The domestic refuse and excrement in Sheffield may be divided as follows:

(1) That which is drained into the sewer and dealt with at the sewage works. At present, only a portion of the city is dealt with in this way, the remainder having the old privy middens, but the corporation has obtained Parliamentary power to compel the conversion of these to the water-carriage system, and such conversion is gradually going on. The sewage gravitates to the precipitation works, where the great bulk is treated with lime and afterwards filtered through coke, the effluent passing direct into the river. There are 30 precipitation tanks, holding 50,000 gallons each, and there are are 60 filter tanks. The precipitation results in large quantities of sludge, estimated at about 50,000 tons per year, which (except a small quantity) has to be taken by rail several miles and tipped, at very considerable expense. The small remainder is given to farmers, who are also allowed 12 cents per ton for taking it away. A scheme is on foot for pressing the sludge into cakes, which may have a better manurial value, but it is doubtful whether any process at present known will result in a profit to the corporation. At present, a small proportion of the raw sewage is being treated on the biological system, and if it is found that the Sheffield sewage, containing as it does a certain amount of trades refuse, can be successfully treated in this way, the sludge difficulty will be very much minimized. The main buildings and tanks cover about 7½ acres, and the total area occupied by the sewage-disposal works is about 23 acres.

(2) Refuse, including ashes, house sweepings, etc., emptied from middens. As far as possible, this material is sold to farmers for manure, but only a comparatively small quantity is disposed of in this way, and the remainder is either tipped to spoil at some distance from the city or burned in a destructor. At present there is only one destructor, but others are in contemplation and will be erected shortly. The destructors will reduce the refuse in bulk by about 75 per cent, leaving 25 per cent of clinker, and this it is proposed to manufacture into concrete flags for sidewalk paving.

STREET SWEEPINGS.

The street sweepings are collected into carts. The main streets are swept by machines during the night, and the subsidiary streets by hand during the day. This material is stored in depots for a time, and largely sold to farmers; the remainder is tipped. All old pots, pans, and such rubbish are tipped along with the house refuse and road sweepings.

GENERAL.

It will be seen from the foregoing remarks that, except in the matter of water-carried sewage, the city of Sheffield has a primitive method of disposing of its refuse. The matter is, however, receiving attention, and more satisfactory methods are being introduced. The population of the city is estimated at about 358,276. The whole of the work is undertaken by the city authorities, a great part of the team work being hired. The total cost of cleansing for the coming year ending March 25, 1899, is estimated at about $218,992.50, some of the chief items being wages and team work for scavenging streets, $73,683.68; food for horses, $15,572.30; wages and team work (night soil), $99,860.59; railway carriage on night soil and street sweepings, $7,299.75; wages at destructor, $3,552.55. The destructor has not been working long enough yet to enable any figures to be given respecting the cost of destruction.

A copy of the city by-laws under the powers of the municipal corporations act, 1835, is sent herewith, as also a copy of the by-laws of the city with regard to new streets and buildings and the drainage thereof. A copy of the Sheffield corporation act, 1890, making further and better provision for the improvement, health, and good government of the city is also forwarded, together with a copy of a report by the medical officer of health on refuse disposal and water carriage in Sheffield.[1]

Acknowledgment is made of the courtesy of the city surveyor (Mr. C. F. Wike) in supplying in part the facts contained in this report.

JAMES JOHNSON, *Consul.*

SHEFFIELD, *April 14, 1898.*

---

[1] All inclosures have been sent to the Department of Agriculture.

NORTH AMERICA.

DOMINION OF CANADA.

BRITISH COLUMBIA.

VANCOUVER.

Consul Dudley writes from Vancouver February 25, 1898:

In reply to Department circular, I give below the synopsis of a letter from the health inspector of this city, Mr. Robert Marrion, answering the inquiries referred to him. Mr. Marrion says:

Vancouver has a population of about 20,000. Garbage consists of general rubbish, ashes, road sweepings, etc. Road sweeping is done by the corporation. Garbage, ashes, etc., are collected by licensed scavengers, and the removal of all such matter is paid for at scheduled rates. All the dry ashes and nonoffensive garbage is dumped, no use at present being found for material sorted from among this matter. The sawdust of the mills is burned in private burners. The offal from the two large slaughterhouses is burned at the city crematory; also all dead animals, foul matter, excrement, etc., being disposed of in the same manner. The Chinese pigkeepers outside of the city collect all kitchen waste in tight tins, approved by the health board. We have 23 miles of sewerage, emptied by tidal flow into the Gulf of Georgia. The sewers are kept perfectly clean by means of 66 automatic flushing tanks. The number of houses connected to the sewers is 1,886; the number of houses not so connected is 1,614. These houses have earth closets, the excrement being collected by licensed scavengers and burned at the crematory.

The crematory was built in 1891. One man is now operating it, at a wage of $65 monthly. About 2¼ tons of coal are used monthly, and about 20 cords of wood.

Nearly the whole of the stable manure is taken by farmers into the country for agricultural purposes. It is given to them for the removal.

SUPPLEMENTARY.

In an undated report (acknowledged by the Department June 17, 1899) Consul Dudley adds:

This city is finding it necessary to give serious attention to the subject of the disposal of its sewage. The mayor and city engineer are at present on a visit to Champaign, Ill. They have gone there as a commission, appointed by the city government, to examine a modification of the septic tank system of sewage now in use in that city.

Vancouver is located upon a peninsula lying between Burrard Inlet on the north and False Creek on the south. The inlet is the harbor and is about 2 miles wide, with a depth of water sufficient to float the largest vessels. False Creek is an estuary which flows in from English Bay for about 3 miles. There is no stream of any size flowing into the creek, and the tide simply ebbs and flows. Therefore, the solid matter of sewage deposited in the creek is likely to remain there. At low water, a large portion of the bottom of the creek is laid bare. If the deposit of sewage in the creek is much longer continued, it will become a serious menace to the health of the city. The city government is at present making an earnest effort to decide upon the best system of sewage disposal that can be procured.

I am of the opinion that the following report of a lecture recently given in this city by George St. George, M. D., chairman of the urban district council of Lisburn, Ireland, will prove of interest to cities in the United States that are confronted with the same question that Vancouver is now considering.

After a few words of introduction, Dr. St. George spoke substantially as follows:

> I can not pass on to the special side of my subject without first referring briefly to the nature and properties of sewage, as a proper understanding of these is absolutely necessary for the comprehension of the process of purification. There is often a disposition to regard sewage as consisting, either wholly or in great part, of excremental matter. This is very far from being the case. There are, for instance, many towns in the north of England where the excreta are dealt with on the dry earth or privy system and do not find the way into the sewers; but in such cases, as the rivers' pollution commissioners have shown, the sewage differs very slightly in composition and strength from that of water-closeted towns, in which the whole of the excrement is admitted to the sewers. Ordinarily, town sewage is made up of bed-room and kitchen slops, soapsuds, and dirty water from laundries, washings from butchers' shops and slaughterhouses, drainings of stables, and waste water from dairies, etc. In short, the greater part of the clean water which is supplied to a town through the water mains returns ultimately to the sewers charged with every conceivable kind of pollution. In addition to the domestic sewage, the sewers of most towns receive also the washings from streets and back yards, which are often fouler than the sewage itself and generally bring down with them large quantities of mud and grit. In manufacturing towns, there are also the waste liquors from the various processes carried on. All these combine to make up what we know as sewage, and the task of the sanitary engineer is to resolve this heterogeneous compound into a liquid which is incapable of producing either nuisance or danger to health. Fresh sewage is generally comparatively free from smell; but when it has lain about for any length of time, as it does in the depressions of badly-laid sewers, it often becomes exceedingly offensive. In other words, it begins to decompose. Now, why does this process of decomposition take place? We may be quite sure that it is not only for the purpose of offending our sense of smell nor yet to stimulate the sale of perfumes and disinfectants. On the contrary, it serves a definite purpose of supreme importance in the economy of nature. The materials which are suitable as food for the vegetable and animal world exist in extremely limited quantities. There is probably not enough of these materials in existence to maintain life on the earth for more than a year or two. Unless they were continually renewed, the world would soon become a desolate wilderness, without animals or plants or life of any kind whatever. But nature, like a careful housewife, uses the same materials over and over again. We do not, perhaps, realize how carefully she collects the foul refuse which we throw aside and builds it up anew into vegetables and meat, to carry us on for another year; or, if we give the matter a thought, we are apt to take it for

granted, in a general sort of way, that the plants which grow in our fields and gardens seize on the manure which comes from animals and build it up into their stalks and leaves. But this they can no more do than we can live on the soil of the earth or the fertilizing matter which it contains. Just as these must be taken up and prepared for our use by plant life, so must the refuse of animal life be prepared for the plants before they can feed upon it. This all-important work is performed by myriads of unpaid scavengers, whose existence was not even suspected until late in the seventeenth century. They are so tiny that it required the powerful microscopes of the present day to make them visible at all. They are known to us as bacteria, or more familiarly as microbes. It is they who seize on the foul matter given off by the animal world and bring it into such a condition that it can support vegetable life. The products of animal life become, first of all, the prey of the decomposition molds and bacteria, whereby it is converted into the various products of decomposition, such as ammonia and nitrites, and these again are seized upon by other workers, which it is convenient to classify as nitrifying bacteria, and converted by them into nitrates. Nitrates, I need hardly remind you, are among the more valuable of our artificial fertilizers. Farmyard manure is largely converted into this form before it becomes valuable as food for plants. The decomposition molds and bacteria are made use of in the septic tank to break down the polluting matter of sewage, and the work of purification is finally completed by the nitrifying bacteria in the filters.

Bacteria are found everywhere, but those with which we are concerned to-night live and move and have their being in the upper layers of the soil. By far the largest part of the droppings of animals is received and purified on the surface of the earth, and this is what we aim at in the sewage farm. When the sewage problem first began to be felt, the eyes of sanitary authorities turned hopefully toward sewage farms. They expected not only to get rid of their sewage, but also to derive a profit from its utilization on the land. The creed of many of these sanitarians was summed up in a phrase, "The rainfall to the river, the sewage to the land." These hopes were, in nearly every case, doomed to be blasted. In all but a very small minority of cases, where local circumstances were exceptionally favorable, the sewage farm has turned out a source of loss instead of profit, and in too many cases it has completely failed to purify the sewage. Often enough, it has proved to be an unmitigated nuisance. The reason for this is not far to seek. Land is undoubtedly the natural receptacle for the refuse of the animal world; and if we were content to live the life of the primitive man, we might safely throw upon the soil the duty of dealing with our leavings; but it is not a natural state of things to concentrate the excrement of several thousand people upon a few acres of land. It is a still less natural proceeding to swamp this land daily with several thousands of tons of dirty water in addition. It is because we do these things that nature rebels and our sewage farms turn out failures. The successful purification of sewage by means of land, day in and day out throughout the year, demands larger areas than are generally available, and what is not less important, the task requires skilled management of a high order, which it is hard to find and still harder to induce a sewage committee to pay for. We are therefore thrown back upon what are called artificial processes of sewage purification. For many years, attempts have been made to solve the difficulty by means of strainers, followed by chemical precipitation. Precipitation, when properly carried out, does undoubtedly remove from sewage the larger proportion of the suspended impurities; that is to say, of the solid matter visible to the eye. But these suspended matters are not got rid of, but merely thrown down as sludge. Great expectations were at one time entertained of the manurial value of the sludge, but here again the hopes formed have been doomed to disappointment. The fertilizers in sludge, like the gold which is present in sea water, have failed to repay the expense of making them available for use. And, after all, the manurial value of all sludge is a very small part of that of the sewage. The royal commission, which investigated this subject from 1858 to 1865, came to the conclusion, as the result of exhaustive experiments, that the sludge contained only one-eighth part of the value of the sewage from an agricultural point of view. To quote the words of Mr. Santo Crimp, in his valuable work on sewage disposal, "except in a few instances, sludge is recognized as a material to be got rid of in the cheapest manner." It is therefore not surprising that two out of the three largest manufacturers of sludge in the Kingdom, viz, the cities of London and Manchester, are now barging their sludge out to sea and sinking it in deep water, and that the third (Glasgow) is on the point of following their example. In less favored towns, the sludge difficulty looms as darkly as the sewage difficulty did before it, and in most cases the cost of disposing of this embarrasing substance adds very largely to the expense of dealing with the sewage.

After the removal of the suspended solids, there remains to be dealt with the polluting matter which is dissolved in the sewage. In order to deal with it effectually, we must have resource to filtration, either through land or artificial filters. Artificial filtration is capable of yielding a very high degree of purification, provided the filters are not forced too high, but the almost universal practice of throwing upon them far more work than they can possibly do has greatly discredited the process, with the result that the local government boards of England to-day decline to accept artificial filters in the place of land. The capability of filters, when properly handled, to deal with the liquid portion of sewage has long been recognized. It remained to find an effective and inexpensive means of preparing sewage for filtration by freeing it from its suspended solids and of grappling with the sludge difficulty. Among others whose duties brought them face to face with this problem was the city surveyor of Exeter, Mr. Donald Cameron. After many years of study and research, Mr. Cameron came to the conclusion that the pollution matter of sewage might be so changed as to be rendered harmless solely by the operation of natural agencies, provided that these agencies were properly detected and controlled. The outcome of his work in this direction is the septic tank, which is probably known, by name at least, to most of those present. The sewage is turned, without any screening or preliminary treatment, into the tank. It enters by two inlets, which are carried down to a depth of about 5 feet below the surface. The object of this is threefold. In the first place, we avoid disturbing the scum which forms on the surface; in the second place, no air can make its way down the sewage; and, lastly, the gases from the tank can not escape back into the sewer. The tank itself is completely covered with a concrete arch, over which a layer of soil is spread. It is about 64 feet long by 18 feet in width. The depth varies from 7 feet to 7 feet 9 inches below the water level. A portion of the tank, near the inlets, is about 3 feet deeper than the rest and is partially cut off by a low wall, forming a couple of pockets or grit chambers, to retain the road detritus which comes down the sewers during storms. The flow through the tank is continuous, and the effluent passes off at practically the same level as the sewage enters. The tank therefore requires no fall. It holds almost exactly one day's average flow, so that the sewage takes, on an average, twenty-four hours to pass through it. That is to say, the sewage which goes in at 10 o'clock this morning will pass out about 10 o'clock to-morrow morning. The rate of flow through the tank is therefore exceedingly slow, being practically imperceptible, so that the solid matter present in the sewage has plenty of time to settle or rise to the surface, according as it is heavier or lighter than the water in the tank. Having thus arrested the solid matter, we draw off the clear water between the scum on the surface and the heavy deposit which lies at the bottom of the tank. To avoid this, a cast-iron pipe is carried across the whole width of the tank, about 15 inches below the surface, and in the lower side of this pipe there is a continuous slot or opening about one-half of an inch wide. Through this opening, the effluent passes off in a thin sheet the whole width of the tank, with the least possible disturbance of the contents of the latter.

So far, we have only arrested the solid matter of the sewage. If we did nothing more than this, we should still be confronted with the difficulty of getting rid of the sludge. But, fortunately, sewage contains within itself the seeds of its own destruction.

Dr. Poore, among others, has drawn attention to the fact that excrement simply teems with bacteria. Several hundred species of these have been counted, of which human fæces alone contains scores. Under the conditions provided in the septic tank, these tiny scavengers attack the impurities of the sewage and gradually resolve them into simpler and simpler forms. The scum which covers the surface is full of bacteria, and serves as "the barm," so to speak, which sets up the fermentation or decomposition by which the solid matter is eventually broken down. It must not be supposed that this takes place instantaneously; on the contrary, it must occupy many days, or even weeks. This is a point which I should like to bring very clearly before you. I remember being taught, when I first went to school, how many men it took to make a common pin. I think it was sixteen, every one of whom had a different operation to perform. Each man did his appointed task and handed the partly-finished pin on to his neighbor to do his share of the work. The bacteria in the septic tank are likewise specialists, each having as a rule some definite work to perform. One squad of microbes attacks a piece of solid matter. The change they bring about is, perhaps, imperceptible. Another group takes up the work where they leave it off, and so, little by little, the solid particles crumble away and disappear. And here I would once more remind you of the exceedingly complex character of sewage. If we could analyze it fully, it would be found to consist of hundreds or possibly thousands of organic compounds, many of them in themselves of a very complex composition.

It is very difficult to take away any single atom from a molecule without completely breaking down the molecule itself. I can not make this point clearer than by comparing the organic molecule to a house of cards. If you are skillful at this pastime you may build up a house containing every card in the pack, but how hard it is to take it down again. It is often difficult to remove even the top card without shaking down the whole structure; and if you attempt to take one away from the bottom, down it comes tumbling about your ears. It is very much the same with the decomposition of organic substances, such as we have in sewage. The abstraction of two or three atoms of a molecule generally breaks the substance down into a number of simpler bodies altogether unlike the original compound. This is especially the case in the septic tank, where the decomposition takes place in the absence of oxygen. As the outcome of these operations, we get an effluent practically free from solid matter and showing a marked purification, even as regards the impurities in solution. On leaving the tank, the effluent first passes through the gauge chamber, where the flow is measured. During the preliminary decomposition it was important to exclude oxygen as far as possible, but having brought the solids into solution it becomes necessary to oxidize them, and this process requires the free access of air. Accordingly, the effluent, after being measured, flows through an aerator, a long trough, over the edges of which it falls in thin films, thereby picking up a certain amount of air. The work of oxidation is chiefly accomplished in the filters, of which there are five, four of these forming the working set. Each filter is 36 feet long by 20 feet wide, and is filled to a depth of 4½ feet with crushed furnace clinker (the hard ash from under a boiler) resting on 6 inches of coarse gravel. In filter No. 3, coke breeze takes the place of the clinker. The tank effluent is admitted to each filter in turn through a valve, and distributed over the surface by a stoneware channel stretching diagonally across it. The filtered effluent is collected by drains laid on the filter floor, and carried back into one of the discharge wells.

The filtration of sewage effluent must necessarily be intermittent, otherwise there could be no real purification, and the filter would soon become exceedingly foul. The reason for this will be apparent when we bear in mind that the work of a filter consists, as already stated, in oxidizing the polluting matter present in the effluent. This duty, like the preliminary liquification of the solids in the tank, is the work of bacteria; but the workers in the filter, unlike those in the tank, which only thrive in the absence of air, require a plentiful supply of oxygen to enable them to perform their functions. In a healthy filter, the bacteria are found in thin films, or "zooglæa," covering the particles of the filtering material. One of the chief products of decomposition of the sewage in the tank is ammonia, a compound with one atom of nitrogen and three of hydrogen. The oxidation of this compound to nitric acid is accomplished by means of the nitrifying bacteria, already referred to. For the purposes of sewage purification, an aerated bacteria filter is virtually the equivalent of land, concentrated into a small area and brought under control. If it is attempted to purify sewage simply by passing it through a filter, it is difficult to insure the uniform distribution of the effluent over the whole area. When a filter is worked in this way, certain parts of it are liable to get more than they can do, while other portions are scarcely brought into action at all. In order to overcome this difficulty, and bring the whole capacity of the filter into play, a novel method of filtration was suggested by Mr. Dibdin, who then held the position of chemist to the London county council. According to his plan, each filter in turn is first filled and then allowed to rest full for a certain time, and then emptied, and finally left to drain and aerate. In this way, the nitrifying bacteria obtain the supply of oxygen which is absolutely necessary to enable them to do their work. It is obvious that this method requires relays of men to be constantly in attendance, to open and close the valves at the proper times. Whether the works are large or small, they require the same amount of attention, and the cost of this would bear rather heavily on a small community. In the septic-tank system, in which filters are worked in the same cycle, the need for this constant attention is done away with by means of an alternating gear, which automatically opens and closes the valves in their proper order. The works are thus rendered completely automatic, and one man visiting them for a few minutes on two or three days per week is able to give all the attention which they ordinarily require. At Exeter, the filtered effluent from the works has been examined at various times by many of the foremost chemists in the Kingdom and found to be of high quality and perfectly inoffensive, and it remains so when kept for any length of time. Most striking testimony to the purity of the Exeter filter was given by the rivers committee of the Manchester city council, in their report of their visit to these works. They have a very practical way of determining the purity or otherwise of an effluent. They keep it in a stoppered bottle at a constant temperature for some five days. At the end of this time, if the effluent is not a good one, it develops an offensive smell. Water from the Manchester ship canal, for instance, becomes putrid when kept in this way. The Exeter filtrate, on the other hand, not only remained sweet, but when mixed with the ship-canal water actually prevented the latter from becoming putrid. The look of the filtered effluent as it runs into the river is so inviting that members of deputations visiting the works often can not resist the temptation to taste it. During the construction of the permanent works at Exeter, the men engaged on this work drank the effluent from the experimental installation in preference to the river water.

The sewage now being dealt with at Exeter is of purely domestic origin, and a doubt has often been expressed whether the same system would be equally successful in dealing with sewage strongly charged with manufacturing refuse. The effect of these waste products in sewage is very apt to be overrated. Manufacturers do not send strong chemicals down the sewers merely for the pleasure of so doing. These chemicals cost money, and in many cases, therefore, they are used over and over again, until their strength is nearly spent. During the inquiry held at Exeter last year, in connection with the scheme for dealing with the sewage of the whole city, the inspectors inquired particularly as to the various manufactures carried on in the city. Dr. Rideal, among others, was called to give evidence on this point. Referring to the spent liquor from a large tannery which he visited, he said it contained no more tannin than he found in the tea at the hotel at which he was staying. He added that the effect of the tan liquor on the sewage would be about the same as if each man, woman, and child in the city took an extra cup of tea every Wednesday and Saturday afternoon. This testimony was borne out by several other chemists of long experience in sewage matters, who had been called in by the city council to report on the advisability or otherwise of adopting the septic-tank system. The capability of the system to deal with manufacturing sewage has been completely demonstrated at Yeovil, with a sewage which is pronounced by competent judges to be one of the foulest in England. In addition to the washings from breweries and slaughterhouses, this sewage contains the waste liquors from several leather-dressing yards, which are charged with dyestuffs, hydrochloric acid, and arsenic. Owing to the difficult character of the sewage, it took some time before the works gave really satisfactory results. They are now, however, yielding an effluent which compares not unfavorably with that from Exeter, and remains quite sweet when kept for any length of time. The difficulty of dealing with a sewage of this kind is accentuated by the fact that the various chemical discharges generally come down in sudden rushes at different times of the day. Taken singly, they would no doubt be very injurious to the filters, and might even ruin them altogether. The successful results obtained with sewage of this class are largely due to the effect of the tank in blending together the various conflicting liquids which come down the sewer from time to time, thus sending on to the filters an effluent of approximately uniform character.

There is one function of a sewage works which must not be overlooked. Sewage not only consists of foul matters which become offensive on decomposition, but it is also liable to contain germs of various diseases. It is well known that persons suffering from certain diseases give off germs or organisms which are capable of communicating the same disease to others. These germs multiply at an exceedingly rapid rate, and, if they were not held in check in some way, the earth would probably have been depopulated long ere this. Fortunately for the human race, nature provides a force capable of combating and destroying these seeds of death. Those same bacteria to which I have already referred, as bringing about the decomposition of sewage matter, are the sworn foes of disease germs, and it is by their means that the ravages of disease are kept within bounds. In the septic tank, and again in the filters, any disease germs which the sewage contains are systematically exposed to their deadly enemies—first of one kind, then of another. The works thus furnish an efficient safeguard against the propagation of disease by the sewage with which they deal.

VICTORIA.

The capital city of British Columbia has about 20,000 inhabitants, scattered over an area of 4,800 acres—3 miles square. One-fourth of the houses—viz, 1,369—are connected with the city sewers, which are 22,667 feet in length, and have their excrementitious and household-waste matter carried off in that way. The sewers run into the harbor and the refuse is carried off by the tide. No attempt has been made to convert refuse matter into use for fuel or otherwise.

The separate-sewer system is used. The surface water runs into the harbor by the natural incline of the land.

SEWERAGE.

For many years, it was the custom to dump refuse matter into vacant lots, causing great complaint and trouble. For the past ten years this practice has been forbidden by law. Now, those houses not connected with city sewer are compelled to provide themselves with iron pans, in which the excrement is deposited. Large tank-covered carts, specially constructed for the purpose, are driven around the different districts into which the city is divided, and the pans are gathered up and their contents emptied into the tank carts, which are required to be kept closed. The work must be done between midnight and 5 a. m. The tank carts are then driven to a large floating tank, alongside wharf, which is capable of holding 2,000 gallons, hauled two miles out in the straits, a trap door in the hold is opened, and the contents are dumped into the sea. Tin cans, bottles, ashes, and all other coarse rubbish are taken in the tanks and disposed of in the same way. For the last seven years this work has been done by contract, at $8.50 each day or night, 365 nights a year. Four carts are thus employed. But this year the competition for the job was so great, that the work in 1898 is to be done for $4.75 per day, which is regarded as less than cost.

Where houses are not connected with the public sewer, the waste waters from the kitchen, laundry, and chambers are carried in wooden boxes or drains into the harbor.

Water furnished by the city, which comes from Beaver and Elk lakes, 5 miles away, is universally used. There are very few wells which supply drinking water; all such are filled up as soon as they become known to the authorities.

GARBAGE.

The garbage is gathered from each house once or twice per week or as often as necessary, for which service occupants of houses must pay, and also provide receptacles. This is done in the daytime, and the whole is likewise dumped in the sea 2 miles from the shore. The land is not underdrained, the soil, while quite fertile, being permeated with rock of huge proportions. The street sweepings, refuse from the stores and business part of the city, and the waste earth from excavations are dumped in the end of James Bay, an arm of the straits which runs easterly from the harbor in the heart of the city. In the course of the past twenty years, several acres have thus been reclaimed. It is anticipated that, if this is continued, the upper portion of James Bay will be filled up some time during the next century.

The factories here have no trouble in consuming all their waste products for fuel. They are inspected occasionally, to see that their surroundings are not a menace to the public health.

ABATTOIR, REFUSE AND ANIMALS.

Abattoirs are not allowed in the city limits. Butchers are compelled to either cremate or bury the refuse of their markets and abattoirs.

Dead animals, horses, cows, cats, dogs, etc., are cremated on Ross Bay beach, under the direction of the sanitary inspector. With two barrels of lime and driftwood gathered from the shore, a horse is so thoroughly cremated in twenty-four hours that nothing is left but a few ashes and the horse's shoes. The cost of such cremation is $8 a head.

NANAIMO.

This is a city with a population of 5,000.

The garbage resulting from the waste of kitchens is collected by Chinamen, who use it to feed pigs. Any garbage or refuse remaining is thrown out upon ash heaps and removed by city scavengers monthly.

Old tin cans find their resting place on the ash heaps, and, with the dead animals, are either buried, burned, or towed outside the harbor and dumped.

There being no system of sewerage, there are no drains except near the sea. Household slops are usually thrown down drains leading to street gutters.

The local health board provides that all cesspools shall be closed and all houses provided with earth closets, having boxes of specified size and type. These boxes the scavenger empties once a month, and the night soil is carted away and dumped outside the city limits.

No slaughterhouses are allowed within the city limits or within 250 yards of any dwelling, other than that of the man in charge. They are subject to periodical inspection, and must be thoroughly cleansed at frequent intervals. All refuse must be collected and disposed of weekly. It is usually turned into manure, and is taken by the small farmers in the neighborhood for that purpose.

WELLINGTON.

The population numbers 2,000. The garbage is collected by Chinamen. Old tin cans and other refuse are removed by the scavenger monthly.

There is no system of sewerage, and all persons are required to provide boxes of a certain pattern for excrementitious matter. These boxes are emptied by the scavenger monthly, and the night soil is dumped outside of town. Drains, where they exist, run into the street gutters. Dead animals are carted away and buried. There are no slaughterhouses in the vicinity.

OTHER TOWNS.

The other towns on the island—Union, Alberni, Chemainus, Duncans, Sidney, Esquimalt, etc.—are small settlements, and are under the regulations of the provincial board of health.

Garbage and other like refuse is consumed and disposed of by each householder. There is no sewerage system in any of these towns. Earth vaults are used.

ABRAHAM E. SMITH, *Consul.*

VICTORIA, *March 8, 1898.*

ONTARIO.

FORT ERIE.

In answer to Department circular dated January 20, 1898, I would say this district has no large city, and garbage, etc., is not treated by modern or scientific methods or in any way that would be of special interest to the Department.

OSSIAN BEDELL, *Consul.*

FORT ERIE, *February 21, 1898.*

GUELPH.

The garbage and sewage in this district are not treated by modern scientific methods, and even in this city, the county seat of Wellington County, there is no sewerage system, which is a severe menace to health.

The town of Berlin, which is situated in the Galt consular district and is considered the most progressive town of western Ontario, has had a "sewer farm" in operation for some two years.

CHARLES N. DALY, *Consul.*

GUELPH, *February 15, 1898.*

HAMILTON.

The city of Hamilton is situated on the southern shore of Burlington Bay, at the head of Lake Ontario, occupying a slightly elevated plateau extending about a mile to the foot of the bluff which encircles the Dundas Valley and reaches Niagara Falls. It has a population of 50,037, according to the census of 1897, and includes within its limits 3,990 acres. The assessed value of property is $29,350,630. The water supply is taken direct from Lake Ontario and filtered through sand before being carried to a reservoir, from which the mains are directly supplied. Burlington Bay is 7 miles long and about 4 miles in its greatest width; it is fed by no considerable streams, and is cut off from the lake by a sand bar, through which a canal nearly one-half mile in length affords entrance; but a sufficient current is not established in the bay for its purification from foreign deposits.

DISPOSAL OF GARBAGE, WASTE, DÉBRIS, ETC.

The scavenger system in operation here does not differ materially from that common to cities of this class, excepting that the men are required to remove regularly all garbage and other rubbish from lanes and alleyways on their respective beats, and clean the same, and also to cut and remove all thistles, grass, and weeds therefrom.

Ashes, cinders, clinkers, garbage, house offal, broken crockery, old tins, and metals of all kinds, branches of trees, grass, weeds, boots and shoes, straw, and all kinds of refuse matter except manure and night soil must be deposited in barrels or boxes by householders and occupants of shops, stores, and public buildings, and the occupants are informed of the hour at which the wagons will call for them. Collections are made weekly, except during the heated term, when they are made semiweekly. Up to the present time, these collections have been dumped, unassorted, into inlets and ravines of the bay, but an incinerator has been practically determined upon by the board of health. This will be connected with the sewage-disposal works, and each householder will be required to keep separate receptacles for garbage and house offal, which, with their fish, fowls, and animals of all kinds (at present buried), will be delivered at the incinerator. For years to come, the inlets and ravines at the bay will afford dumping ground for all other waste. The cost of the scavenger service for the year 1897 was $5,977. During the coming summer, it is proposed to increase collections to an extent which will add nearly one-fourth to the cost. It is impossible to give the number of houses connected with the sewers, as they are not enumerated in the official reports. There are nearly 51 miles of sewers in the city, draining an area of 2,327 acres, leaving 1,663 acres not yet drained, the latter being in the form of recent additions to the old city limits. There are 7,050 privy vaults and 673 earth closets in use in the city; these are mainly connected with the older and poorer class of dwellings. The excrementitious matter is removed by scavengers licensed by the city, the owner or occupant of the building paying the cost. It is used on the farms near the city as fertilizer. The street sweepings of the asphalt pavements are given free to farmers, who contract to remove them every night. The cleaning is done by the city under the direction of the street commissioner. There are no slaughterhouses within the limits of the city, and only one packing house. The refuse from the packing house, as well as spoiled meats from the market house, are sold to a manufacturer of fertilizer. The sludge that is pressed into cakes at the sewage-disposal works is estimated to be worth $2.04 per ton as a fertilizer. Being a novel product, the farmers have not yet realized its value, and thus far it has been given free to any who will take it away. The amount of sludge cake from 474,000 gallons averages 2,412 pounds.

SEWAGE DISPOSAL.

I transmit with this report the annual report for 1897[1] of Ernest G. Barrow, O. L. S., D. L. S., M. Can. Soc. C. E., member Sanitary Institute (England), city engineer and manager waterworks, to whose courtesy I have been under great obligation during the prosecution of this inquiry.

In 1852 and 1853 the first main sewers, on James and Catherine streets, were built into the bay, and the present system steadily developed until completed in 1884. In 1895, the discharge of sewage into still waters at the east end of the bay was proven a nuisance, and an injunction obtained from the high court of justice restraining its further deposit. In 1896, a by-law providing for the erection of sewage-disposal plants at the east end inlet and the foot of Ferguson avenue, and authorizing an appropriation of $85,000 therefor was voted by the people, and in May, 1897, the first plant of that character in the Dominion of Canada, and, so far as I can ascertain, the third on the Continent of America, was completed and ready for service at the east end. As these works drain only the east end of the city, which is a residence portion with a population not exceeding 8,000, the average daily volume of the sewage to be disposed of in dry weather is only 474,000 gallons.

The annual cost of operating the east end station is estimated as follows:

Wages	$2,388.00
Lime, 1,204 bushels	192.64
Alum, 15,000 pounds	225.00
Coal, 598 tons, at $2.10	1,255.80
Oil and waste	100.00
Total	4,161.44

The substitution of sulphate of iron for alum is expected to make a very material saving, and the superintendent estimates that the quantity of coal used will be hereafter reduced. The estimates for the Ferguson avenue station are not much in excess of those for the East End station, although the capacity is more than quadrupled, and the engineer is satisfied that the entire sewage of the city could have been handled in a single plant at a great reduction in percentage of annual cost. The cost of the east end plant was about $38,000, and its capacity is an average dry-weather flow of 500,000 imperial gallons. The second plant, at the foot of Ferguson avenue, has been completed and put in operation this winter at a cost of about $44,000. Its capacity is an average dry-weather flow of 2,000,000 imperial gallons. As improvements suggested by the practical operation of the East End plant and by examination and comparison with other disposal systems have been incorporated, this may be assumed to exhibit the status of such appliances to date.

---

[1] Transmitted to the Department of Agriculture.

Under the guidance of Mr. Robert MacKay, superintendent of the Ferguson avenue works, I made as thorough an examination of the plant as was possible for a nonprofessional. The works are situate directly on the bay front. The 2-story brick building contains two centrifugal engines, each with a pumping capacity of 3,175,000 imperial gallons every twenty-four hours, making a disposal capacity of at least 6,000,000 gallons daily. The territory drained by the sewers emptying into these works comprises the business, a large part of the manufacturing, and the principal residence districts of the city, so that the population served may be safely put at between 30,000 and 35,000. All the sewers in the district empty into an interception sewer one block above the works, and thence the sewage is carried by one main sewer to a receiving well, which is at the west end of the building. This well is 14 feet deep from its top to the bottom of the mouth of the sewer and 4 feet below the mouth of the sewer halfway across, and thence 6 feet to its deepest part. The well is 12 feet in diameter and is divided in the center by an upright grating, through which the sewage filters into the deeper part of the well. The purpose of this grating is to keep back paper scraps or any rubbish washed into the sewers that would choke the suction pipe and the pumps. It requires frequent attention, and is kept free and open all the time. After the sewage filters through this grating it passes into the lower part of the well, in which are the suction pumps. The centrifugal pumps are in the end of the building adjoining the receiving well, and in ordinary weather, one pump will dispose of the sewage as fast as it runs into the well. In the rainy season both pumps may be required, but in case of serious flooding, where the combined work of the pumps is not sufficient, a butterfly valve is provided outside of the well, which may be closed and the contents of the sewer for the time being carried down to the bay, passing through a weir at its mouth. This, however, is only a temporary expedient, for as soon as the sewage in the well is lowered to the mouth of the sewer, the valve is opened and the combined power of the pumps keeps the well clear until another rush from the sewers occurs. As the daily dry-weather flow of sewage in this district does not exceed 1,500,000 gallons, it will be seen that, except during extreme rainfalls, the two pumps will be more than able to dispose of it.

The sewage is pumped into a channel that runs from west to east of the building. In the center of the building are the two mixers, one containing lime and the other sulphate of iron in solution. These ingredients are proportioned at the rate of 3 grains of lime and 1 grain of sulphate to each imperial gallon of sewage passing through the channel on its way to the outer weir at the east end of the building. This begins the deodorizing process. The superintendent is of opinion that he can diminish by one-half the quantity of lime, and also make a liberal reduction in the sulphate used at the East End station. In extremely cold weather, he thinks he can do the work without either lime or iron. In the year 1896, at the disposal works in the city of London, England, it cost $410,000 for alumina, which was originally used with the lime. In 1897, sulphate of iron was found to be a substitute for the alumina, and by its use there was a saving of $285,000 for that year. Both of the Hamilton works are now using sulphate of iron, but Engineer Barrow has conducted experiments to a stage where he feels confident that by adding filters of anthracite coal, only the solution of lime for precipitation will be required. The coal evidences a chemical action not shown in experiments with coke and charcoal. His experimental filter is filled with 6 inches of sand, 12 inches of coal dust, 4 inches of ½-inch coal, 10 inches of 1½-inch coal, and 4 inches of 2½-inch coal. The coal in these filters, after being in use a year, may be replaced and used for fuel.

The rush of the sewage toward the channel that leads into the precipitating tanks begins the work of purification. There are six precipitating tanks, 140 feet long by 35 feet wide. In the center of each tank is a sludge drain. The sewage is conducted from the weirs into the precipitating tank, and, slowly passing through the tank, the black sludge is precipitated to the bottom and the clear water allowed to pass out into the channel on the north side and down steps, to aerate it; this is then discharged into the bay. When the water arrives at this point, it appears as clear and free from odors as drinking water from a hydrant. At the entrance of each of the precipitating tanks are two valves, one of which is called the "skimmer," through which the water passes, and the other the sludge valve, through which the sludge is carried down through pipes that run in an underground tunnel and on to the sludge well at the rear of the building. From this well, the sludge is pumped into the presses in the building and subjected to a very high pressure. It is pressed into cakes 28 inches in diameter and half an inch in thickness, and is then ready to be carried away for use as a fertilizer. Its value as a fertilizer is indicated by the following report of Prof. E. B. Shuttleworth, analyst, of Toronto:

The following is the result of an analysis for manurial purposes of the press cake from the sewage disposal works at Hamilton:

	Percentage.
Total nitrogen	.470
Phosphoric acid as phosphoric anhydride	.276
Potash as potassium oxide	0.038
Moisture	22.890

The press cake was evidently not in the condition as received from the press. As such, it would have contained about 50 per cent of moisture. It had been to some extent air dried, but not as fully as possible. In order that a comparison may be made with similar sludges produced in English sewage works, I have compiled the following table. All of these sludges were not produced by the same method or process, and some were air dried, as indicated by the amount of moisture, but if this contained water is borne in mind, the results are fairly comparable. In order to calculate theoretical manurial value, it is customary to take the nitrogen in the form of ammonia, and the phosphoric anhydride as phosphate of lime. The estimation may therefore be more intelligible if expressed in this manner: Ammonia, 0.57

per cent, or 11 pounds 4 ounces to the ton; phosphate of lime, 0.60 per cent, or 12 pounds to the ton. I append in this relation some of the calculated theoretical values of sludges, but it must be remembered that these values are only comparative, the real commercial worth being that which can be realized in the market.

Percentage manurial contents of various sewage sludges.

	Hamilton.	Birmingham.	Bradford.	Leeds.	Coventry.
Nitrogen	0.470	0.49	0.62	0.66	0.92
Phosphoric acid	.276	.72	.80	.64	1.56
Moisture	22.89	13.16	8.90	16.40	14.04
Value per ton	$2.04	$2.44	$3.23	$3.67	$4.31

The low value of the Hamilton cake may be attributed to three causes: (1) The greater amount of moisture present; (2) variation in process; (3) smaller proportion of water closets in houses on sewage areas.

In order to exhibit the Hamilton sludge in relation to barnyard manure, I append the following comparison, from which it will be seen that the partially air-dried cake is of about equal theoretical value with that of ordinary fresh cattle manure, and below that of good well-rotted dung from well-fed cattle.

Comparison of barnyard manure with Hamilton press cake.

	Hamilton press cake.	Fresh manure.	Rotted manure.	Good rotted manure.
Nitrogen	0.47	0.45	0.58	0.64
Phosphoric anhydride	.27	.21	.30	.53
Moisture	22.8	71	79	75
Potash	.03	.52	.50	.50

It will be necessary to remember that in practice, farmyard manure of equal manurial value with sewage sludge is preferable to the latter, as it leaves the land in a more open and suitable condition. As far as my experience with manures in this country goes, I do not think that it would be wise to calculate much on the press cake as a source of profit. This view is in accordance with general experience in England.

When the sludge drain in the center of each precipitating tank becomes full, the water is drawn off to facilitate cleaning it out. If the water so drawn off is not clear and free from odor, it is sent down through pipes in the tunnel to the sludge well and again passed through the presses, when it comes out clear and almost sparkling. There is no odor to the water, and after the sludge passes through the presses it is also solid and odorless. The building in which the pumps, presses, and all machinery is located is divided by a glass partition, so that the engineer can have oversight of the working of the machinery and be free from any noxious odors that may arise while the sludge is being pressed; and that is the only stage during the whole process, from the time the sewage leaves the receiving well at the start until the solids are passing through the press, that is in any way offensive. The water passes into the bay apparently pure and clear, and the sludge, if not used as a fertilizer, may be burned in the incinerator with the garbage of the city. Experiments now in progress may show that the sludge can be so chemically treated that it may be used as fuel in the furnaces and cause a saving in the coal bill.

The officials and people of the city of Hamilton believe that they have solved the problem of sewage disposal, and that the method in use here can be adapted to any city or community without extravagant cost.

JAS. M. SHEPARD, *Consul.*

HAMILTON, *March 26, 1898.*

LONDON.

Consul Culver sends from London, under date of February 19, 1898, official reports[1] concerning the present condition of work on the sewers in that city, from which it appears that $150,000 are to be expended in the construction of intercepting sewers and the establishment of filtration beds. The length of the new sewers will be 39,325 feet, of which 21,000 have been completed.

Consul Hunt, of Palmerston, under date of May 28, 1898, sends the following clipping:

[From the Daily Free Press of London, Ontario, Wednesday, May 25, 1898.]

SEWAGE DISPOSAL AND PURIFICATION.

Our system, which is known as the international process, is recognized as being the best method of sewage purification, and it may be stated that it is the most widely used and adopted in Great Britain.

The process is too well known in Great Britain to need a lengthy detailed description, but briefly it may be said that the purification is effected first by deodorizing the sewage and precipitating the solids in settling tanks by means of a chemical precipitant and deodorant known as ferozone, and then by filtering the ferozoned sewage through a specially prepared filter bed containing polarite, through the medium of which a very high degree of purity is obtained in the effluent.

The international system was first put into operation in England about eleven years ago, at the sewage works of the then local board of Acton, now the district council, where the system is still in successful operation.

The combination of the ferozone and polarite system has been most successfully carried out since then by a great number of councils, corporations, and other authorities, as it recommends itself on account of the small space required for the tanks and filters, the fact of the works being thoroughly under control, the use of no costly plant or machinery, and the minimum amount of labor required to carry on the process. Its consequent economy and assured efficiency have given to the process the foremost place among the sewage-disposal systems of any country.

In explanation of the process: The sewage receives its proper proportion of ferozone as it flows from the sewer into a channel through which it passes to the settling tanks, the ferozoned sewage flowing on into another channel, which surrounds the top of the tank on the outside and passes down from it through a series of vertical pipes which enters and delivers the sewage into the tank near the bottom, thus aiding materially the sedimentation of the suspended matters carried by the sewage, and depositing them almost as soon as the sewage has been delivered into the tanks. The sewage water then rises up inside and flows out through iron channels placed across the mouth of the tanks near the top to the filters and comes out again from the filters, having a sufficient degree of purity to allow it to flow into any river, stream, or body of water without polluting the same.

---

[1] Forwarded to the Department of Agriculture.

The candy precipitation tank, which embodies new and valuable principles both for the removal of the sludge and for the inlet of the sewage into the tank, is the outcome of exhaustive experiments, and it has solved the sewage-tank problem.

The method of working the candy tank is as simple as it is effective. The bottom of the precipitation tank is built flat, in the center of which is pivoted a horizontal perforated pipe, reaching out to the side of the tank. This pipe is pivoted on another pipe, which may be carried up to within a foot or two of the full water level in the tank, through which the sludge is discharged without pumping. The pivoted pipe is revolved from the outside of the tank when the tank is being cleaned. The perforations in the pipe being on the underside thereof and only a few inches apart, and the pipe itself being but a very little above the bottom of the tank, just enough to clear it, therefore, when rotating the pipe, every inch of the bottom will be thoroughly cleaned from sludge, this being drawn or sucked away from the whole of its surface, whence it can be piped to any desired spot. The movement of the perforated pipe during the cleaning process is very slow. It creeps over the bottom of the tank, sucking into itself the thick sludge, without the possibility of any disturbance in the tank.

The sludge produced is only about half the bulk of that which is drawn or swept away from any other form of precipitation tank. This is a feature of great importance, inasmuch as the sludge is the foulest thing in the whole of the sewage treatment, and to reduce its bulk or minimize the quantity of water mixed with and polluted by it is a point the importance of which will be recognized by all. Furthermore, the removal of the sludge as described does not interfere with the flow of the sewage into the tank while that process is going on, for when once the "candy" tank is started, its working need never cease; by day and by night the sewage, with the addition of the precipitant, is running into the tank, and as continuously running out of it in a clarified condition. The sludge being removed at intervals, as described, the tank is kept clean and sweet. Moreover, the rotation of the sludge pipe can be caused to cleanse the sides of the tank by means of a squeegee attached to the shaft. The time taken to remove the sludge is from three to ten minutes, varying with the size of the tank, and very little power is required to rotate the sludge pipe.

The method by which the sewage is let into the tank is also of great importance, inasmuch as it causes the effluent water to become clear and bright, and in good condition to go to the filters.

The chemical which we use, called ferozone, is acknowledged to be the best and most powerful precipitant and deodorant known for sewage purification. It is rich in salts of alumina and salts of iron, both in the ferrous and ferric condition. By virtue of its soluble salts it soon causes subsidence of the suspended solids. Ferozone attacks the molecular constitution of that portion of the organic matters in solution which can not be removed by ordinary precipitation in the settling tanks. It so alters the constitution of these putrescible matters that further oxidation thereof by filtration through polarite becomes certain, and under complete control at all times. The sludge precipitated by it is richer in ammonia than that produced by the lime or other processes, and is therefore of more value as a fertilizer.

Polarite is successfully used in the filters for purifying the ferozoned sewage water from the putrescible matter which is dissolved therein. Polarite is a black, hard, and highly porous substance, insoluble in water and practically everlasting, and does not require to be renewed. It is also a powerful deodorizer and decolorizer, as well as a purifier, by virtue of the oxygen occluded in its microscopic pores, and constantly supplied by the surrounding air and water. It purifies polluted waters by oxidizing the already partially broken down noxious organic matter dissolved therein, and converting them into innocuous, inorganic, and saline matters.

The efficacy of a deodorizing, decolorizing, and purifying material depends mainly on its power of occluding oxygen. The efficacy of polarite as a purifier, of polluted waters is marvelous and its duration unlimited. As a water purifier, it can scarcely be overestimated. The polarite filter beds at the Acton and Hendon sewage works are now as good and effective, after continuous use since 1887, as when they were laid down. Polarite supplies a long-felt want for sanitary purposes where a satisfactory sewage effluent or a good drinking water is required. The oxidizing and purifying powers of polarite have been fully tested and favorably reported on by such high authorities as Sir Henry E. Roscoe, F. R. S., etc.; Dr. E. Frankland, F. R. S., etc.; Prof. Henry Robinson, and other eminent sanitary scientists.

The clarified sewage water that flows on the polarite filter beds from the tanks for final purification produces an effluent that satisfies the demands of the most advanced sanitary critics. It will not decompose in hot seasons, but it will remain inodorous, nonputrescible, clear, and tasteless. It would not kill fish, and it is purer than the natural waters of many rivers.

The international system has been in constant and successful use by Her Majesty's Government at Parkhurst, Isle of Wight, since 1889, and at Balmoral Castle, and also at the public works of various corporations and councils, including those of Acton, Hendon, Huddersfield, Castle Douglas, Guildford, Swinton, Normanton, Royton, Astley Bridge, Crompton, Chorley, Gorton, Alcester, Lincoln, and quite a number of other places, where it has been adopted, after full investigation, in preference to all other systems.

It is in operation in India, Singapore, Malta, Gibraltar, the Cape of Good Hope, Australia, and at the Cahir Barracks in Ireland.

The company have permission to publish the following abstract from a report made by Dr. E. Frankland, Ph. D., D. C. L., LL. D., M. D., F. R. S. (one of Her Majesty's commissioners to inquire into the pollution of rivers), to Major Tullock, R. E. C. B. (the chief engineering inspector of the local government board), on the results of his investigation of the above-named company's process as carried out at the sewage works near Acton, where the crude sewage is first treated with ferozone in subsidence tanks for precipitation, and the effluent therefrom then passed through polarite filter beds for final purification:

"These results show that the raw sewage contained a very large proportion of highly polluting suspended matter and an unusually large amount of foul organic matter in solution; and further, that the effluents from the subsidence tanks and filter were derived from sewage of about equal polluting power as regards dissolved organic matter.

"In the subsidence tank, the suspended matter was reduced from 240.80 parts per 100,000 of raw sewage to 5.92 parts per 100,000 of tank effluent, whilst the effluent from the filter was free from suspended matter. It was clear and transparent. This is a satisfactory result.

"The effect upon the dissolved organic matter in the subsidence tank is very remarkable, its amount being reduced to little more than one-tenth of that present in the original sewage.

"In its subsequent passage through the filter, the dissolved organic matter is still further reduced to nearly one-sixteenth of that present in the original sewage. It is now in a state of purity greatly exceeding that prescribed by the standard of the rivers pollution commissioners.

"No chemical process of purifying sewage has ever, in my experience, approached this in efficiency; and if the results obtained at Acton can be accomplished in other places, a most important advance will be made in the purification of the sewage of towns.

"I need scarcely add that the effluent from the filter is not only clear but inodorous and inoffensive. It is, of course, not fit for dietetic purposes, but it may be admitted in large volumes into running water without creating any nuisance."

Since Dr. Frankland's report was made, results equal and superior to those obtained at Acton have been accomplished by the International Company's system at other sewage works erected by them, thereby fully confirming Dr. Frankland's opinion.

PALMERSTON.

Conditions in this consular district offer no suggestions whatever contributing toward the object expressed in the Department circular. The disposal of garbage and sewage in any manner other than that employed in primitive days, or the utilization of either for fertilizing purposes, are subjects that do not appear to engage the attention of the people in this community. Of the thirty-two largest towns in this district, with populations ranging from 200 to 3,100, not one has what might be termed a thorough system of sewage, or any up-to-date methods of disposing of the contents of same or of utilizing garbage or other wastes for fertilizing purposes. Generally, individual cesspools are employed for home drainage by the more prudent, but where there is a stream to facilitate the same, an occasional property owner drains to it, in the most direct manner, however, seldom carrying the drain beyond the limits of the corporation, regardless of the fact that in the summer months, when the streams are low or nearly if not quite dry, the deposit becomes a menace to the public health. Once a year, the premises of property holders in the small towns in this vicinity are required to be cleared of ashes, cans, garbage, weeds, etc., and the expense thereof is borne by those immediately benefited. All such accumulations are hauled to some low or waste spot in the town or outskirts, and there made to do duty in the forming of new ground or the filling in of the approaches to bridges, culverts, etc. A few of the residences and hotels of two or three towns on Lake Huron and Georgian Bay have availed themselves of those bodies of water for drainage purposes, but it is doubtful if a town system of sewerage, even in places on the lake front, exists in the entire district. Application to the town clerks and health officers of the representative towns for by-laws and health reports of interest in this connection, elicits only the response that by-laws have not been printed for many years and are unobtainable, and that health officers' reports, whether made verbally or in writing, are seldom if ever printed, never for general distribution. The few that have been examined in the local papers contain no recommendations of value outside the particular town interested. Dead animals are required to be disposed of by the owners and at their own expense; there is no thought of utilizing them in any way. Wood ashes (wood being more generally used for fuel than coal) are usually saved through the winter and sold in the spring to local collectors, who buy for United States manufacturers of fertilizers. Slaughterhouse and market refuse is cared for by the owners of such places at their own expense. In view of the facts stated, it is perhaps needless to say that the filtration or chemical treatment of sewage and the cremation of garbage receive no attention here.

LOTON S. HUNT, *Consul.*

PALMERSTON, *April 12, 1898.*

PORT STANLEY AND ST. THOMAS.

The population of St. Thomas is (approximately) 13,000.

The waste of animal and vegetable foods is mostly collected by persons living on farm lands adjacent to the city, and used for feeding swine. A considerable number of householders burn such waste material.

Tin cans, bottles, broken glass and crockery, ashes, old shoes (when not burned), scraps of leather, worn-out household articles, and cooking utensils of metal or other materials are deposited in the ravines. In this way street sweepings, being largely dust of stone and clay, are used to fill up ground. The ravines are very deep and a large quantity of refuse is used. The last 4 feet of filling is good earth.

The streets are macadamized, broken stone being used for the surface; the main street is paved with cedar, but is soon to be repaved with vitrified brick. All are swept.

Household waste waters are generally run into sewers, but in cases where there is no sewer connection, such waters, with the exception of chamber waste which is put into the privy vaults, are thrown on the ground. The yards or garden lots, as a rule, are large, all residence houses being detached, with a good-sized space between them.

Dead animals of all kinds are removed to a place outside the city limits and buried, no particular spot being selected for the purpose. Market refuse is treated in the same way.

All scavenger work in this municipality is done by private parties, who are paid by the individual having garbage removed, or at whose expense it may be removed when ordered by the inspector. The prices charged are: For a 1-horse load of ordinary garbage, 25 cents; for a 2-horse load, 50 cents.

Excrementitious matter not water carried is removed to a farm and plowed in with straw as fertilizer. It is removed by the air-tight barrel system, a deodorizing disinfectant being used while the work is in progress. The cost to the householder is 40 cents per barrel, or $2 per cubic yard.

The sewer system is combined, and discharges into a large creek outside the city limits.

As the city does not appoint any person to do scavenger work or contract to have the same done, but merely requires, through its inspector, the householders to keep their premises in good sanitary order, it is impossible to ascertain the income accruing to those who perform the work.

The city is regarded as one of the most healthful in the Province, the people being unusually exempt from epidemic or extraordinary disease.

M. J. BURKE, *Consul.*

PORT STANLEY AND ST. THOMAS, *February 26, 1898.*

TORONTO.

Consul Sewell sends from Toronto, March 21, 1898, copy of the city engineer's report, containing accounts of street cleaning, garbage disposal, etc. The following extracts are from the report:

The city of Toronto is situated upon the northern shore of Lake Ontario, about 40 miles easterly of its western terminus. It lies in latitude 43° 39′ 10″ north, longitude 79° 23′ west, on a plateau gently ascending north for a distance of 3 miles, where an altitude of about 220 feet above the lake level is reached. It extends about 8 miles along the lake and is generally level, with slight depressions at points where minor water courses formerly existed. The River Don flows through the eastern part of the city and the River Humber immediately to the west of its western limit. The harbor is formed in front of the city by a sandy island that lies to the south, at a distance of about a mile and a half. The area within the city limits, not including the island or portions of city land covered by water, is 10,391 acres, or 16.2 square miles. In this area there is a population of 220,000, by city directory census. There are 257.40 miles of streets, of which, including broken-stone roadways, 177.9 miles are paved and 79.74 miles unpaved; 82¼ miles of lanes; 228.52 miles of sewers; 249.627 miles of water mains. Annual revenue from waterworks, 1896, $454,000; 7,000,000,000 gallons of water supplied annually. Total assessment of property in city, $192,995,522; property in city exempt from taxation, value, $22,158,516.

Percentages of different classes of pavement in the city.

	Per cent.
Cedar block	42.23
Stone and scoria	.31
Asphalt	5.67
Wood on concrete	.21
Macadam	15.43
Unpaved	30.98
Cedar block, with asphalt between tracks	2.47
Cedar block, with brick between tracks	1.92
Macadam, with stone sets between tracks	.27
Brick on concrete	.51
	100.00
Total ... miles	257.40

STREET SPRINKLING.

The wagons distributed 104,053 loads, representing 52,026,000 gallons of water, making a grand total of 74,237,500 gallons consumed this year in the street-watering service.

We have received inquiries and requests for information regarding the trolley system of distribution from various municipalities throughout the province where an electric street-car service is in operation, the scheme apparently being generally approved of.

SCAVENGING.

There have been no changes of importance in this branch of our work. It is satisfactory to note that our efforts to induce householders to keep ashes and garbage in separate vessels, also to discontinue the practice of throwing the stuff loosely on the lanes, have met with a fair measure of success. The total number of loads removed by the scavengers was 109,096, of which 32,329 were garbage and the remainder (76,767) ashes. The garbage was consumed at the crematories, together with 448 dead cats and 397 dogs. The ashes were used for filling in various lands.

STREET CLEANING.

This important service, so closely allied to the health and comfort of the citizens, has received every attention. The work has been very much handicapped as regards block-paved streets by reason of their defective condition, it being simply impossible to clean them thoroughly, with the numerous holes and cavities in the blocks making a lodgment for the dirt. The expense of the work is also materially increased from this cause. The main thoroughfares, paved with asphalt, are still cleaned by the patrol or hand system during the summer season. It is the only satisfactory method where the traffic is heavy. We have, however, discontinued the system on most of the asphalt-paved streets in the residential section, substituting the machine brooms, which are put on once, and occasionally twice, each week. The reduction in the expenditure on that branch of the work has been applied to the ordinary street-cleaning service. The appropriation voted by council was $54,000, out of which we spent $11,694.47 before the date of commencing the cleaning proper—namely, March 18—on the removal of snow from bridges, street intersections, roadways, channels, etc. Allowing a further sum of $4,374.56, cost of cleaning asphalt pavements, leaves $37,930.97 as the sum spent on the regular service. Total miles cleaned, linear, was 1,886, which makes the cost per mile $20.11. Number of loads of sweepings, scrapings, etc., removed was 44,806, the bulk of which was used for filling in various sites.

SEWERS.

Only 1,600 feet of 9-inch and 260 feet of 12-inch pipe sewers have been constructed during the year. The attention of the department has been devoted largely to the examination, reconstruction, repairing, cleaning and flushing of existing sewers, and the construction of manholes and gulleys to facilitate future examinations and repairs and better disposal of water from the surface of the streets. The total length of sewers of all kinds in the city is 228.52 miles, and the length of sewers flushed and cleaned during the year was 123.6, at a total cost of $2,764.81, or at the rate of $22.36 per mile.

NEW BRUNSWICK.

ST. JOHN.

The city has an estimated population of 45,000. St. John was established about the year 1783 and is located on high rocky hills on the Bay of Fundy, thus affording plenty of fall to carry off its sewage. There are combined sewers constructed on each street, emptying into the bay. All of the garbage not fit for fertilizing is dumped into the ravines on the bays at the expense of individuals, and is also used to fill up and make roads. The fertilizing portion is hauled to a private grease and fertilizing establishment at the expense of the company; hence there can be no estimate of the cost. The waste of the fertilizing establishment is gathered by the farmers. This has been the manner of disposing of the garbage ever since the city was organized. There is no public crematory for garbage.

The waste waters from the kitchen, laundry, and chambers are generally conducted into the public sewers, and where there are no sewers the same are emptied into cesspools, and when they are filled the farmers take the contents for fertilizer.

About three-fourths of the buildings in the city are connected with sewers. The excrement is either hauled off at the expense of the owner or some individual takes it for fertilizing.

The street sweepings are collected on the paved streets by the city sweeper, and on other streets by hand labor, and the waste hauled to the public dump at the expense of the city. The cost can not be ascertained, from the fact that the statement is kept in the general city street accounts.

The liquid wastes from the factories are conducted into the public sewers, and the other wastes are disposed of in the same way as general wastes.

Old meat from the market is sent to the fertilizing company and the balance conducted to the sewers.

Refuse from the abattoir and dead animals are gathered by the fertilizing company, for which a small consideration is paid.

St. John is the only city of importance in my consular district.

IRA B. MYERS, *Consul.*

ST. JOHN, *February 16, 1898.*

WOODSTOCK.

I have to report as follows concerning the sewer system in use at this place, which is the only town of any size or in which a sewer system is in use in this district:

The corporation of Woodstock has a population of between 4,000 and 5,000. Its sewer system was begun in 1893. At present, not quite the whole corporation is connected, but it is expected that practically all will be during the coming summer. The sewers empty into a tank, which when full empties into the St. John River. It is flushed with water. No effort is made to utilize the sewage or garbage of any kind with the exception of wood ashes, which are largely sold for export to the United States. Street sweepings, with other garbage, are disposed of in the river. The factory wastes are also disposed of in this way. Abattoir refuse is commonly thrown into hog yards, and later used for farm fertilizing. No disposition is made of dead animals other than to cover them with earth.

FRANK C. DENISON, *Consul.*

WOODSTOCK, *March 16, 1898.*

NEWFOUNDLAND.

ST. JOHNS.

St. Johns, the capital and principal city of the colony of Newfoundland, is situated on a hillside and has a population of 28,000. The disposal of garbage, sewage, etc., is not effected in a modern, scientific method in this city or any place in the colony. There are no printed reports from municipal or health officers.

I have the honor to transmit the following general report on the subject. I am indebted to the city engineer, J. Ryan, for the information.

The new or separate system was commenced in 1889. Rudolph Herring, of New York city, was consulting engineer, and Charles J. Harvey, of St. Johns, city engineer. The work was designed with a view to suit the requirements of a population of 60,000. The outfall is situated near the mouth of the harbor, where the current carries all floating matter out to sea. The outfall sewer is of brick, circular in form and 3 feet in diameter. The main trunk sewer is oval (new form), with hollow earthenware invert and earthenware junction blocks, and varies in size from 3 feet 6 inches to 2 feet 9 inches drainage area. The northern sewer varies from a 24-inch circular sewer to a 12-inch earthenware pipe at its upper end. The western sewer varies from a 24-inch circular brick sewer to a 9-inch earthenware pipe. The sewage of this section is discharged into the harbor through a temporary outfall, which will eventually be pumped into the trunk sewer.

Before the introduction of the new system, a number of stone and earthenware pipe sewers were built, which discharged into the public drains leading to the harbor. When the new system is completed (there are many laterals yet to be laid) these old sewers will be made to do duty in draining the surface and subsoil.

Nearly all the houses in the city, excepting those of the poorer class, are furnished with water-closets and baths. A rigid inspection of plumbing is established.

The sanitary department of the municipal council has fifteen teams for removing ashes and sweepings each morning. The employees also remove night soil in covered iron carts, each night after 11 p. m., from houses not supplied with water-closets. All this is carted to farms outside the city limits, and mixed with peat or clay by the farmers. Rags, old boots, etc., are burned by them when sorting the manure.

MARTIN J. CARTER, *Consul.*

ST. JOHNS, *March 25, 1898.*

NOVA SCOTIA.

YARMOUTH.

The disposal of garbage, sewage, etc., is not effected by modern scientific methods in this district. The town of Yarmouth has a fair sewerage system for a place of its size (8,000). The sewers empty into the harbor, which is kept quite clean by the rise and fall twice each day of a tide of 15 feet. Ninety per cent of the houses in the town limits have kitchen sewer connections, and 60 per cent have water-closet connections.

There is no municipal regulation for the collection of garbage or other rubbish, and it is not done by the authorities. It is, however, done quite well by private individuals, who use such portions as are available for fertilizing, by reducing them in the ordinary compost pile known to all farmers.

Ashes, sweepings, paper, and other coarse rubbish are deposited at a spot designated by the authorities and are used for filling low places.

RADCLIFFE H. FORD, *Consul.*

YARMOUTH, *March 7, 1898.*

QUEBEC.

QUEBEC.

The city of Quebec is estimated by good judges to contain about 72,000 inhabitants. There are two lines of sewers, one emptying into the St. Lawrence and the other into the St. Charles River.

The garbage is mostly collected under the direction of the street department and burned. This method has been employed for the past two years. Tin cans, bottles, broken glass, etc., are burned in the refuse heap. All houses in the city are connected with the sewer system, and all household and kitchen water is carried off in that way.

The streets are kept clean by the street department at the cost of the city. I can not give the cost, as it is not kept in a separate account.

The waste of manufacturing establishments, if liquid, goes into the sewers; other matter is burned.

Each marketman must take care of his refuse. The city conveys dead animals to a convenient place and burns them at a cost of about $200 per year.

WM. W. HENRY, *Consul.*

QUEBEC, *February 25, 1898.*

GASPÉ BASIN.

In response to the Department instructions of January 20, 1898, I have to report that there are no waterworks or sewer systems in this consular district, and no system of any kind for the removal of garbage. There are no cities in this district; only small villages of from 200 to 800 inhabitants.

ALMAR F. DICKSON, *Consul.*

GASPÉ BASIN, *February 21, 1898.*

MEXICO.

CIUDAD JUAREZ.

Referring to Department circular of January 20, 1898, requesting information concerning the disposal of garbage, sewage, etc., in foreign cities, I have to state that the matter is not one treated by modern scientific methods in my district, and would be of no special interest for other reasons.

Ciudad Juarez is a border town with no sewage system, and no organized method of disposing of garbage is employed.

CHARLES W. KINDRICK, *Consul.*

CIUDAD JUAREZ, *February 24, 1898.*

TUXPAN.

In answer to Department circular, I have to state that this city's method of collecting garbage is most crude and unscientific, and there is nothing of special interest to report on the subject.

A. B. JONES, *Consul.*

TUXPAN, *March 9, 1898.*

BRITISH HONDURAS.

This colony does not use garbage or sewage for agricultural purposes. Night soil is deposited in the river, the sea, or in canals that cross the town. Garbage that would be injurious to health or offensive is buried. Dead animals are removed outside the limits of the town and buried or left to the carrion crows. All other garbage or rubbish is placed in boxes and barrels outside of residences and storerooms, where it is collected by carts and used to reclaim lands from the swamps that surround Belize. It is not possible to obtain copies of the sanitary laws of the colony, but the foregoing are the most important points.

Belize is the largest town in the colony, and has a population varying from 8,000 to 10,000, according to the season. During the year 1897, the public scavenger collected and carried to the suburbs of the town about 9,000 cart loads of rubbish, of about one-half cubic yard each, at a cost approximately of $4,500. The work is in charge of the district board. The garbage above mentioned includes tin cans, broken glass and bottles, crockery, ashes, floor sweepings, paper, and other coarse rubbish.

There are no sewers in the town. All night soil must be deposited in the river, canals, or sea, after 8 o'clock p. m. Householders are compelled to use buckets with covers for conveying night soil to the water side. Public and private latrines are placed over the water, as they are not allowed on the land. There are no systems of waterworks in the colony. The only manufacturing establishment in Belize is an ice factory, the ashes from which are used as filling for low lying ground.

Market and abattoir refuse is used for manure, cast into the sea, or thrown outside the slaughterhouse for the crows. Dead animals are hauled to the "campo santo," where some are buried and others left for the crows, who make short work of them. The town scavengers remove all dead animals found in the canals that cross the town. These canals were dug for sanitary and fire purposes, and are flushed by the river or sea, according to the tide.

Belize is the cleanest town in Central America, and, with the exception of occasional epidemics of yellow fever, is fairly healthy as a place of residence.

ALBERT E. MORLAN, *Consul.*

BELIZE, *March 4, 1898.*

GUATEMALA.

Referring to Department circular of January 20, 1898, concerning the disposal of garbage, sewage, etc., I have to report that modern scientific methods are not employed in my district. Sewage is diverted into the numerous barrancas or ravines, while garbage is dumped in an indiscriminate heap outside the cities or villages, and all animal matter is immediately consumed or carried away by buzzards. These birds are the scavengers of the country, and every city and village has multitudes of them. They are protected by law, as well as by public opinion, and are of invaluable aid in promoting sanitary conditions.

A. M. BEAUPRÉ, *Consul-General.*

GUATEMALA, *March 11, 1898.*

HONDURAS.

Garbage is utilized to no purpose whatever. Towns and villages near the seacoast throw all offal, waste of animal foods, tin cans, bottles, broken glass and crockery, ashes, and refuse of all kinds into the sea. Towns in the interior gather and throw it on a dirt pile and cremate it three or four times a year, all the work being done by persons owning homesteads, at their own expense, which is very trifling.

There are no sewers. Every person sweeps the streets opposite his dwelling in such manner that the whole is kept clean.

There are no factories. Market and abattoir refuse, as well as dead animals, are thrown into the sea or cremated. The currents of the harbor take all floating substances out to sea in a short time.

R. WOODVILLE, *Vice-Consul.*

UTILLA, *March 15, 1898.*

SALVADOR.

San Salvador, with a population of 25,000 inhabitants, is located at the base of the San Salvador extinct volcano in the valley Hermosilla. Sewerage is by gravitation. Most of the houses are connected to the main sewers by a kind of catch-basin arrangement. The main sewers do not carry the surface water of the streets, which are thoroughly cleaned in the wet season by drenching rains. As they are concave, the centers form small rivers at those times. During the dry seasons they are swept by palm branches, which catch only light material, such as papers and leaves or grasses. Owing to the visitations of earthquakes, as well as the poor construction of the sewers, there is a great deal of leakage.

Garbage collection is under control of the municipality, and the service is poor and doubtless not remunerative. No statistics on the subject can be had. A crematory has been built, but when put in operation it was found that the expense of the fuel was too great to run it, hence it remains idle. Garbage wagons are sent to the private houses once a day, and whatever has been gathered is distributed at various dumps located in the suburbs where it is desired to fill some hole or cavity. Here the vulture feasts every day.

The market places have long since been made subjects of complaint, and time and again remonstrances have been presented in regard to their filthy condition, without permanent relief.

JOHN JENKINS, *Consul.*

SAN SALVADOR, *March 23, 1898.*

WEST INDIES.

CUBA.

SAGUA LA GRANDE.

I have to acknowledge receipt of Department circular of 20th January last, calling for information relative to the disposition of garbage, sewage, etc., and to say in reply, that if there is a country from which no such report is possible, it is this island.

WALTER B. BARKER, *Consul.*

SAGUA LA GRANDE, *February 28, 1898.*

SANTIAGO DE CUBA.

There is probably no district where our Government has a consul where there is less to be learned on the subject of garbage and sewage disposal than the one in which I am located.

With very slight exceptions, there is nothing but surface gutter drainage, and this so imperfect that water usually finds its way quickly to the center of the steet, where it drags lazily along and is left to soak or evaporate. In times of heavy rains nine-tenths of the people throw all of their waste garbage into the street, to be washed down to the low grounds of the city.

About the same proportion of people allow their cesspools to fill up and run over; occasionally, they dig a fresh receptacle or vault.

Perhaps one-tenth of the inhabitants keep barrels in the yards and have them hauled away when filled. The cartman dumps the contents in the suburbs. Even the things that would burn, such as paper, cast-off clothing, or bedding of the dead, are thrown into the streets or dumped by the roadside.

Fertilizing the soil by any process whatever is an innovation not yet put in practice in my consular district. This may not seem so strange when I am able to state that I have seen cane fields where from 50 to 80 tons of sugar cane have been annually taken for sixty-five years, with no apparent diminution of the crop.

Dead cattle, horses, mules, and large dogs are hauled to the suburbs and dumped by the roadside, the same as other garbage. All other animal matter is thrown into the streets or on a neighbor's roof, to be devoured by buzzards.

Before throwing a dead cat or dog into the street, it is customary to tie a cord to the tail of the animal; this insures having it hauled away from the door, as the children will play horse by dragging it around the street, and seldom deliver it again to the owners.

PULASKI F. HYATT, *Consul.*

SANTIAGO DE CUBA, *February 26, 1898.*

DUTCH WEST INDIES.

Replying to circular of January 20, 1898, in regard to the disposal of garbage, sewage, etc., in this place, I wish to state that there is nothing in the method used for the disposal of the wastes of this city that would be of any interest to the Department.

L. B. SMITH, *Consul.*

CURACAO, *March 21, 1898.*

FRENCH WEST INDIES.

There is no sewer system in either Pointe à Pitre or Basse Terre, the only two cities in Guadeloupe, and naturally there are no water-closets, sinks, or waste pipes. The abundant water supply flows through small square gutters into the sea. In lieu of water-closets, huge sugar-loaf-shaped jars of pottery are found in every house. These are emptied into tin receptacles which are collected daily by scavengers. The service costs about $1 a month per family of four persons.

Household waste, tin cans, broken glass, etc., are piled in heaps in the streets in front of the houses every morning, together with street sweepings, and these piles are carried away by other scavenger carts.

Each household must keep its premises and the sidewalk clean, keep the gutter free, and pile refuse in front of the house early every morning. The Government employs women to sweep the streets.

There are no animal scavengers, as vultures, dogs, etc. The system works fairly well in cool weather, but is not regularly kept up. Fortunately, the intense heat rapidly dries up everything not carried off by the pure water ever flowing in the gutters.

LOUIS H. AYMÉ, *Consul.*

GUADELOUPE, *March 8, 1898.*

HAITI.

All of the principal cities here are situated on the seashore. The drainage is entirely surface. There is no underground sewerage in any of the cities, and all of the garbage collected, including accumulations of waste from houses, but not animal manure from stables, is deposited in the streets and side gutters, and during heavy rains is carried into the sea or carted to the shore by the municipal authorities, who have a regular system of street sweeping. The refuse from the stables is carted away at the expense of the owners thereof. This is also taken and dumped on the seashore. The water-closets are built underground, bricked up and cemented, making a tight receptacle. The refuse from these is taken away in buckets by men employed for the purpose and carried to the outside limits of the city.

There is no use whatever made of any waste for fertilizing purposes, either in the cities or in the country. The soil, being very rich, does not require any artificial fertilizing, and consequently the refuse is all used for the purpose of making land on the seashore. All dead animals are removed at the expense of the city authorities. They are taken to the city limits and either buried or burned. There are no official regulations beyond what I have mentioned, and no board of health that looks after the sanitary condition of the city. There is a medical jury, composed of four physicians and one pharmacist, which is supposed to care for the sanitary condition of the city, but very little, if any, attention is paid to it by that body. It is left entirely with the mayor of the city.

JOHN B. TERRES,
Vice-Consul-General.

PORT AU PRINCE, *March 2, 1898.*

SANTO DOMINGO (DOMINICAN REPUBLIC).

I have to report, pursuant to instructions contained in Department circular relative to obtaining information in regard to the disposal of garbage, sewage, etc., in foreign cities, that the matter is not treated by modern scientific methods in this consular district or in any part of the country. The garbage of this city, for instance, is collected in carts periodically and dumped into the sea. This applies equally to street sweepings, factory wastes, market and abattoir refuse, and dead animals. There is no water-carried sewage. I therefore conclude that the subject as treated here can have no possible interest for the Department.

ARCHIBALD H. GRIMKÉ, *Consul.*

SANTO DOMINGO, *March 21, 1898.*

SOUTH AMERICA.

ARGENTINE REPUBLIC.

The city of Buenos Ayres has a population of 780,000.

The material collected consists of general refuse from dust bins, the amount gathered daily being about 400 tons. A firm has a contract with the municipality and collects the refuse in its own carts from door to door. These carts have a capacity of about a ton. All garbage of dust bins, containing animal and vegetable matter, tin cans, ashes, etc., is placed in a box overnight on the doorstep, and the following morning an open garbage cart collects and removes same to Puente Alsina, an open space situated about a mile from the city. The various materials are then sorted and sold under contract, and the residue is then burned in heaps, filling the neighborhood for miles around with smoke and stench, according to the direction of the wind. It is impossible to obtain information respecting cost of removal or the profits made by the contractors.

Street sweepings, etc., are also collected by the contractors, but the greater portion is cremated, the richness of the Argentine soil dispensing with any need of manure. There is a large variety of pavements throughout the city, consisting of asphalt, wood, block stone, macadam, plain soil, etc.

Factory waste is disposed of according to its nature; some kinds pass into the main sewers, while others are removed and cremated.

Market and abattoir refuse is all utilized. After preparation, it is either employed locally or exported. The chief items exported are horns, bones, bone ash, hoofs, hair, hides, tallow, cooking grease, dried-meat cuttings, jerked beef, dried blood, entrails, etc.

Horses, mules, bullocks, and asses are utilized as above, while dogs and cats are cremated.

Broken glass and bottles are used by the glass manufacturers.

Tin cans, crockery, ashes, sawdust, floor sweepings, and paper are cremated.

Grease is used for tallow making.

Tin cuttings have no value, and the roads in the neighborhood of the dust heaps are chiefly composed of them. The chief tin factory is within a short distance, and all the waste material is disposed of in this manner.

WATER-CARRIED SEWAGE.

The main sewerage, with which nearly every house in the city is connected, is worked by very powerful pumps situated at Bernal, about 10 miles from the center, and the sewage is carried through a covered ventilated canal to the River Plate, a little below the city.

Household waste waters from the kitchen, laundry, and chambers pass into the main sewer within the city; in other localities, into cesspools that are emptied periodically by a contracting firm which employs suction carts of the compressed-air system. These cesspools are often placed in close proximity to the house and within a few yards of the drinking well; hence the large percentage of typhoid fever cases.

There are no sewage farms, for the reason already stated—that the natural soil is so rich and the climate so good that manure is unnecessary, except for use in a small way by horticulturists.

It is impossible to estimate the volume of sewage passing through the main canals.

DESTRUCTORS.

In the year 1889, proposals were made to the Government for the erection of large destructors for treating the entire garbage of the city, but on account of the monetary crisis the project was shelved "pro tem." With the improved financial condition of the country, fresh interest in the matter has arisen and the proposal is once more under consideration.

D. MAYER, *Consul.*

BUENOS AYRES, *August 25, 1898.*

BRAZIL.

There is nothing in the disposal of sewage and garbage in Rio de Janeiro that would interest agriculturists. The sewage is disinfected and conducted into the bay; the garbage is gathered indiscriminately at short intervals, transported to a neighboring island and then and there cremated. This work is intrusted to an English stock company, which is at present doing a losing business, owing to the great depreciation of Brazilian currency in which it is paid.

EUGENE SEEGER,
Consul-General.

RIO DE JANEIRO, *April 1, 1898.*

CHILE.

Antofagasta has about 14,000 inhabitants.

The city authorities collect in their own carts, without charge, everything making up garbage. Garbage barrels must be ready on the curb *when carts pass* by. The cost is considerable. The items are not kept eparately, but go into general expenses. The carts haul the garbages to a point some distance from the city and dump it. The town people freely overhaul it and take away anything they can find of use to them. When the pile gets too large, it is burned or calcined.

The province of Antofagasta is a desert, and there is no interest in agricultural use of the products of garbage and sewage.

Tin cans, bottles, ashes, sweepings, etc., are treated as garbage and carted off, as described above. If the tin cans are in fair condition, they are taken out of the dump ground and used in many ways. Petroleum tins are opened and used for roofing and for walls of houses. The best are selected for pails and flowerpots. Nothing else is saved.

The city gives permits to private contractors to undertake the removal of waste water. Each house provides itself with eleven-gallon tubs, of a number equal to its daily needs. These are well tarred. The carts come in the early morning, take away the full tubs and leave empty ones in their place. The carts haul the tubs to a wharf well to the north of the town and dump the contents into the sea. The contractors charge 3.6 cents to 7.2 cents, gold, per tub, according to distance. Excrementitious matter not water carried is treated in the same manner as above and by the same contractors, but the carts come in the night. The charge is 22 to 45 cents, gold, per tub, according to distance from dumping wharf. The other coast towns of this consular district employ similar methods for the disposal of garbage, sewage, etc.

Although all the towns are favorably situated for such works, no sewage plant exists in any of them. Responsible people have a proposition before the city authorities of Antofagasta to construct a complete plant. They propose to flood the pipes with sea water pumped into tanks above the town. Considerable passive resistance is encountered. Some even prefer the present method, and others dislike the obligatory service under the proposed contract.

Street sweepings and other refuse are treated as garbage. The products of the province are entirely mineral, and there are no factories.

The abattoir belongs to the city, and the refuse is turned into the sea.

Dead animals are thrown into the garbage carts and hauled to the dump ground. The town people are allowed to take off hides and skins.

C. C. GREENE, *Vice-Consul.*

ANTOFAGASTA, *April 22, 1898.*

COLOMBIA.

CARTAGENA.

Garbage in Cartagena is collected by carts, under contract with the government, the service coming under the direct control of the police department. The city is divided into a certain number of districts, and certain days are marked out for each district. The householders gather garbage on the days appointed (usually twice a week) and set it outside the door early in the morning. It is then carried away by the carts some distance out of the city and deposited on the beach, where the vultures pick out all carrion. Once a week, of evenings, the refuse is set on fire. All the combustible materials, such as woods, rags, straw, etc., completely disappear; if there are dead animals, only the bones are left.

People farm, generally, on a small scale, and would not take the trouble, if manure were given them free, to scatter in on their lands. They would prefer to move to some other piece of ground, considering that land needing fertilizer is not worth cultivating.

RAFAEL MADRIGAL, *Consul.*

CARTAGENA, *February 28, 1898.*

COLON.

Colon has between 5,000 and 8,000 inhabitants, mostly negroes from Jamaica. The white population consists of perhaps 300 or 400 Americans and Europeans. These whites live on or near the beach in houses owned by the Panama Railroad Company. The sanitary condition of this small part of the town is very good. The parts of Colon occupied by negroes, Chinese, and others are, however, much less satisfactory, being undrained, filthy, and full of foul odors. All refuse matter (slops, bottles, tin cans, broken glass, etc.) is thrown into the streets or, much worse, into the inner courts of the houses. The streets and vacant lots are partially cleaned once a year by convicts. The cost of street cleaning can not therefore be given. So far as I can learn, no part of the sewage and refuse matter of the town is utilized in any way. A few houses owned by the railroad company have water-closets with sewer connections, the sewers emptying into the sea. The form of closet in general use is of a primitive and most offensive sort, and the closets are, at least in many cases, seldom or never cleaned. I have myself visited the part of the town of which I speak. I have gone into the houses, looked at the courts and closets, inspected the yards, alleys, and streets, and can say from personal knowledge that it is almost miraculous that Colon is not a hotbed for the development and diffusion of pestilence. Negroes, however, are said to be exempt from yellow fever, and this immunity no doubt explains why Colon is not a more dangerous port than it is. In the rainy season, stagnant water backs up under the houses and into the courts, and it is said that the negroes then suffer severely from malarial fevers. I am compelled to say, though, that the negroes appear to be healthy and contented in spite of their surroundings. Some parts of Colon are directly in the swamp, the only way to reach the houses being narrow plank walks held about 2 feet above the surface of the water by piles. This portion of the town I have not had the courage to visit personally, though I have frequently passed through it on the train. It is inhabited by negroes, Chinese, half-breeds, etc. Market and slaughterhouse refuse, dead animals, etc., are either disposed of in the swamp or sea, or eaten by those invaluable scavengers, the buzzards and vultures.

GEORGE H. MURPHY,
Vice-Consul.

COLON, *March 28, 1898.*

PANAMA.

In response to the Department's circular of January 20, 1898, I have to report that the garbage and sewage of this place are not treated by modern scientific methods.

There is in the city of Panama a very imperfect sewerage system. Rain is gathered in tanks during the wet season and well water is pumped into the same tanks when it is dry, and this water is used for cleaning. Of course the amount of water is frequently inadequate for the purpose. Other refuse matter is carted out of the city and burned in a furnace purchased from the United States. There is great need of sewers and waterworks in this city, and the authorities hope that before long all defects will be remedied.

H. A. GUDGER,
Consul-General.

PANAMA, *April 7, 1898.*

ECUADOR.

Each householder at Guayaquil is required by law to deposit garbage in front of his residence after 6 p. m. It is taken by the city contractor and dumped upon the low-lying marsh lands near the Salado, on the northwestern outskirts of the city.

Guayaquil boasts no sewerage system. It could be made a delightful city if modern methods were adopted. Situated upon an almost flat plain encircled by lofty hills or peaks, it is most picturesque. The water supply, abundant and of excellent quality, is brought by pipes from Agua Clara (about 52 miles distant), a rivulet gushing from the first spur of the Andes. With proper sewers and pavements, with the mud flats, now a source of disease, filled up and converted into a beautiful park, this would be an ideal South American city.

PERRY M. DE LEON,
Consul-General.

GUAYAQUIL, *March 18, 1898.*

PARAGUAY.

Consul Ruffin writes from Asuncion, April 16, 1898:

Asuncion has about 40,000 inhabitants. The municipality has made a contract with a private individual, at a cost of $4,500 paper (about $640 gold) per month, to clean the streets. This covers the collection and disposal of garbage, which is composed of vegetables, tin cans, crockery, ashes, floor sweepings, paper, and various rubbish. Only parts of the principal streets are swept.

A cart drawn by four mules passes around to private houses to collect garbage. What is clean is usually shoveled out at the embankment behind the capitol building. The rest is carried off to some dump in the city suburbs.

Waste waters from the kitchen are usually put into a sink leading to a passage which conducts them into the street, there to be absorbed or to pass down a slight declivity. There are no waterworks in the city.

Market refuse is thrown away. Dead animals are frequently permitted to lie in the streets; no use is made of them.

There is no means of conducting excrement from the hotels and private dwellings. A large hole is dug in the ground, and when that is filled another is dug.

There is no law regulating the collection of garbage except that which commands payment of so much per month by each householder for its removal.

Under date of April 4, 1899, Consul Ruffin writes further concerning the primitive system of sewerage in the city of Asuncion. In the total absence of any water system in connection with closets, the sewage is collected in barrels and tanks, the contents of these being carted to the rear of the city and dumped upon the sands, rendering a large portion of the suburbs uninhabitable. The consul believes that the city offers, in this connection, a profitable field for American capital. He says:

> I do not think it a hazardous undertaking for any American to invest a few thousand dollars in sewage apparatus for Asuncion, where, I feel sure, his fortune will be made.
>
> The cost of cleaning is about $1 gold per barrel.

URUGUAY.

Montevideo has a population of 250,000. It has the well-established reputation of being the cleanest city in all of South America, and, therefore, remarkably free from all diseases incident to filth. Its death rate is the lowest known. The drainage is into the bay and the River Plate, by a modern system of sewerage. The streets are nearly all paved with blue or red granite blocks, produced near the city, and the somewhat torrential rains keep them in a perfect condition of cleanliness. Besides, they are swept every night, either by hand or machine. The garbage is removed outside of the city in carts, and is used for filling ground; some of it is sorted out for fertilizer by the gardeners. This work is all done by contract, under the supervision of the police. The waste from households is put into boxes, and these are placed at the front door of every house. Not later than 8 o'clock a. m., carts come by and gather the contents and take them to the same dump, distant about 5 miles, on the banks of the River Plate. It can be said that the work is well done, also that no economical disposition is made of either sewage or garbage, save in the small way mentioned above.

A proposition, it is announced, has been made by some French capitalists to take charge of the cleaning work under a lower rate. They propose to erect works that would permit a thorough utilization of all garbage and waste, cans and bones, and that portion of the excrementious matter not carried away in the sewers.

A portion of the city is not yet sewered, and service is rendered by night-soil carts with bodies of iron, so arranged that the cargo may be easily emptied. The cost of the service can not be given, but it is not done at a loss.

ALBERT W. SWALM, *Consul.*

MONTEVIDEO, *April 13, 1898.*

VENEZUELA.

Maracaibo, with a population of 50,000, more or less, has no sewer system. The city lies only a few feet above the level of the lake, upon a sandy, light-clay soil. Drainage is unknown, only a few water-closets existing. The Government building, custom-house, hotels, etc., have large water-closets, but they are never cleaned. A few carts pass through the main streets and collect the refuse from the houses, for which work a small sum is paid by the city government. The refuse is dumped into the many holes of stagnant water and mire around the city, to fill them up. Until lately, swine and goats were the street cleaners, but as there is smallpox in middle Venezuela, the presence of these has been prohibited by the sanitary board.

For the last few years lake water has been distributed by pipes to the houses, but as there are no sewers, the dirty waters filter into the ground around the houses and thence into the streets. There is no fresh-water course nearer than 30 miles.

It rains very little; I have seen nearly a year without rain, but the rains when they come are generally heavy. The water runs in torrents through the sandy streets, the people throw out their accumulated refuse and all is swept into the lake. The bay is gradually filling up with the offal of the city. Rain water is gathered in large cisterns by the well-to-do people and sold to the poorer classes as long as they have a surplus. The poor must be satisfied, for the most part, with the brackish water from the lake; in consequence, the death rate is high.

E. M. PLUMACHER, *Consul.*

MARACAIBO, *April 10, 1898.*

AFRICA.

MADEIRA.

Funchal has a natural drainage. The city is situated on the side of a mountain in which four rivers have their sources, flowing through the city to the sea. The fall of these rivers is so great that after heavy rains, stones are driven from their places and carried to new lodgments or into the sea. The streets are paved with small round cobblestones, and an ordinary shower sweeps all extraneous matter from them into the rivers, leaving the city clean.

There is a partial system of drains for water-carried sewage passing under the principal streets, and there is a project for a more complete system.

The present sewers run directly into the sea, and when the southerly wind blows, cause an offensive smell on the lower beach.

There is no municipal system for the removal of garbage or other waste matter. The householders must remove it at their own cost, under penalty.

The street sweepings are collected in wooden receptacles and removed from the city each day. They are put up at auction each year and bring about 25 cents per box of 600 pounds average. The purchaser has to remove the boxes and replace them when empty. The sweepings are valuable as manure, and if it were not for the high cost of cartage would be worth considerably more than the price paid, which covers about one-third of the cost of sweeping. The refuse is taken outside the city and either at once laid on the land and covered, or placed in manure pits. The sweeping is done entirely by hand labor, and with brooms made of the common heather that grows on the mountain sides.

All refuse from the market and slaughterhouses passes directly into the sea by underground sewer.

Dead animals are removed at the cost of the owner, and there is no way of estimating the expense.

The population of Funchal is 35,665, according to the census of 1892.

T. C. JONES, *Consul.*

FUNCHAL, *March, 1898.*

MAURITIUS.

I cannot answer in full the questions asked in Department circular, owing to the fact that I have been unable to find any printed report published in the colony dealing with the questions of sewage and garbage disposal. I must, therefore, give a summary, rather than a lengthy report, upon this subject.

Port Louis is said to contain a population of between 60,000 and 70,000 inhabitants, the great bulk being composed of a very heterogeneous mass of negroes and Asiatics, whose habits are of a disgusting character. The town is divided into districts, and the scavenger work is done by several contractors. The garbage is collected daily. This filth, together with the street sweepings, is removed by the contractors and burned in an adjoining suburb. There is no special plant used, as the garbage is burned in the open air. Very little use is made of the residue. The ashes are employed as an absorbent by the manure company.

The scavenger work is done in the most primitive manner by the lowest caste of coolies. The brooms used are made from a sort of rough firs, which they gather in the neighboring hills, and their shovels consist of a piece of tin, usually the cast off bottoms of American petroleum cans; they more frequently load their carts with their naked hands.

There is nothing done with tin cans, etc. The mayor tells me that there are hundreds of tons of broken glass and the like at an outlying village, where this kind of rubbish is dumped.

There is no sewer connection whatever with any of the houses throughout the island. The waste water is allowed to flow into the harbor of Port Louis by means of surface drains. There is no system of underground drainage in Port Louis, though some mains have just been laid in that part of the town which was destroyed by the great fire of 1893.

The excrementitious matter is not carried away by water in Port Louis, or in any of the towns of the colony. It is removed by contractors, who supply each house with tubs for use in a roughly constructed water-closet, which is situated in some part of the yard. For the use of each tub, the tenant has to pay a fee of one rupee (about 30 cents) per month to the company, which is a heavy tax on the poorer class of the population. As they can not afford to pay this fee, they must suffer filthy surroundings, which no doubt constitutes one of the chief reasons why Port Louis is a hotbed of malaria.

This human excremont, together with the slaughterhouse and market refuse, is sent to two manure manufacturers, who work it up into a very rough sort of fertilizer. This mixture is sold at a low rate to sugar planters under the name of "Engrais Normal." The process is primitive. There are no factories in Port Louis, or in the interior of the island, except on the plantations. These are used in extracting juice from the sugar cane.

As above stated, the market and slaughterhouse refuse is removed by contract, under the supervision of the municipality. All dead animals are burned outside the town, and the ashes are allowed to blow about wherever the winds may carry them.

JOHN P. CAMPBELL, *Consul.*

PORT LOUIS, *June 29*, *1898.*

MOROCCO.

Replying to the Department's circular of January 20, 1898, relative to the disposal of garbage and sewage, I have to report that no care of them is taken in this country by public means, except what is done at Tangier under the direction of the commission of hygiene, composed of resident foreigners. The matter is not treated by modern scientific methods, and hence any report from this district would be of no special interest.

FRANK C. PARTRIDGE,
Consul-General.

TANGIER, *March 12*, *1898.*

ST. HELENA.

All house garbage, waste of animal and vegetable food of all kinds, tin cans, bottles, ashes, iron hoops, broken glass and crockery, street and house sweepings, stable and cow-pen refuse, and house sewage in this town are carried to the water side and there dumped into the sea. The main sewers and water courses are under control of the Government. The work of carting away refuse above described is done by householders, and there is no use whatever made of the materials collected.

ROB. P. POOLEY, *Consul.*

ST. HELENA, *April 16*, *1898.*

ZANZIBAR.

I have to report in answer to circular of January 20, 1898, that I have fully investigated the matter, and find that garbage and sewage are not treated by modern scientific methods here. The work is all done in a crude way, and no part is utilized commercially.

JOHN C. BILLHEIMER, *Consul*

ZANZIBAR, *May 7*, *1898.*

ASIA.

BRITISH INDIA.

Garbage, sewage, etc., are not treated by modern scientific methods in this consular district.

In Calcutta the streets are swept daily, but none of the sweepings or garbage is used for manure, all being carted about 4 miles from the center of the city and dumped into a low swamp. In 3 wards out of 25, an incinerator is in operation. Eighteen out of 25 wards are sewered, and the sewers drain into a tidal river about 6 miles east of the city, and the sewage is carried out into the bay.

Only a few wards have latrines connected with the sewers, and the whole system is very imperfect, one of the main difficulties being the want of water.

Waterworks about 8 miles above the city furnish filtered water for drinking and culinary purposes, and another establishment in the city pumps directly from the river for sewers, latrines, and street watering.

I regret not to be able to make a more satisfactory report, but this country is far behind in modern methods of sanitation, and it is a wonder that this city is not scourged with epidemics growing out of its filthy condition.

R. F. PATTERSON,
Consul-General.

CALCUTTA, *March 30, 1898.*

CEYLON.

Prior to the beginning of this year, the garbage of Colombo was mostly carted to vacant lots in the outskirts of the town and there deposited.

On the 1st of January, 1898, a new system was adopted, which up to the present time has worked so imperfectly that a longer experience is desirable before it is reported upon.

The following newspaper cutting, from the Colombo Observer of the 16th instant, gives a fair synopsis of the scheme.

> Very few residents, we suspect, have a proper idea of the elaborate night-soil system devised and carried out by Mr. Davidson. To obtain a correct view, a visit to his depots with the arrays of coolie lines and bullock sheds, as well as to the incinerators, with observation of the extent of work carried on, is necessary. The estimate is that in the case of Colombo, 150 tons of night soil should be dealt with each twenty-four hours. So far, 65 tons have been taken, but it is only a question of time until the whole city is served. Trouble with drunken coolies neglecting their work, careless handling, and ignorant blundering were to be expected, and these explain the complaints hitherto made. So far, the capital invested is 50,000 rupees ($16,000); the estimated expenditure for the year, 116,000 rupees ($37,000); probable expenditure, 104,000 rupees ($33,200); estimated receipts, 98,000 rupees ($31,300); probable, 105,000 rupees ($33,700); while 8,000 rupees ($2,500) are saved on the scavenging contract.

There are four divisions, each under an overseer with two suboverseers, 80 day coolies, 240 night coolies, 16 depot coolies (under separate establishments and depot keepers). Seven thousand units (i. e., standard buckets) dealt with nightly. A large and growing business in clearing cess pits, and suction machinery in preparation. The efficacy of cinerators is doubtful; on a large scale they are, it seems, nowhere a success. But negotiations are in progress with Messrs. Boustead Brothers to attach the Shoreditch destructor cells to their electric generative plant.

W. MOREY, *Consul.*

COLOMBO, *March 24, 1898.*

CHINA.

CHEFOO.

In China, no attempt is made to collect garbage or regulate the sanitation of towns or cities. In most towns there are open sewers running along the middle of the street, sometimes covered by flagging. In the spring these flags are taken off in order to allow of their being flushed, but often no attempt is made to clean the sewers, and in time the streets are full of puddles of stagnant, filthy water. On a warm day the people perform their ablutions at the open doors of their houses and throw the dirty water onto the street.

At the ends of lanes and in corners are piles of refuse, which remain undisturbed, slowly accumulating until the passageway is nearly closed. At the doors of the houses, on the narrow paths, in fact in the most conspicuous places, are large kongs, earthen jars, into which is thrown the night soil, fermenting in the hot sun and polluting the air. In the spring the stench is simply horrible. The farmers pour it on top of their growing crops. It is impossible to convey to one who has never seen China an idea of the indescribable filth of the city streets. Each family throws the refuse of the house out of doors, to be trampled on by the passing throngs, or greedily devoured by the half-starved mangy dogs which infest all places.

Old tins, bottles, rags, the merest trifles are utilized in one way or another; nothing is wasted.

In the treaty ports, there are sections of the town set off for the residence of foreigners, where of course there is an effort to keep the streets clean, but it requires the most vigilant care, for a coolie does not hesitate to empty the night soil right in the roadway.

The cleanest cities in China are Hangchow and Ningpo. In the center of those two cities I have myself seen dogs eating bodies of babies; the rotting bodies of cholera corpses; snakes slowly winding in and out; mangy dogs, slime, dead cats; human excrement—most horrible filth on one side; across the way, the glitter of gold, pomp, and luxury; such are the principal features of a Chinese street.

The garbage collector is the dog or the starving beggar.

JOHN FOWLER, *Consul.*

CHEFOO, *April 4, 1898.*

PEKIN.

Consul Ragsdale writes from Tientsin, May 2, 1898:

In compliance with instructions of January 20, 1898, I submit a report with reference to street cleaning, etc. The methods used, if not modern, may be of interest. For place of report I have selected Pekin, the capital of the Chinese Empire, population estimated at 1,000,000.

GARBAGE.

The material contains but little animal matter. All animal food is comparatively costly, and the mass of the people are poor. There is very little waste, and animal and vegetable refuse is devoured by dogs. These dogs have no other visible means of support. The garbage removed is principally coal ashes. The amount is small, as fires are used only for cooking. The method is house-to-house collection. The work is done by private enterprise, and the material deposited in vacant lots and in front of houses whose owners do not employ the collectors.

TIN CANS, BOTTLES, ETC.

Tin cans are much prized by the natives, and are a regular article of commerce. Over one-half of the water buckets of Pekin are Devoe's patent petroleum cans. When beyond use as a bucket they are flattened and made into anything from a candlestick to a bath tub—the latter being used only by foreigners.

Empty bottles command a good price and are in demand.

Broken glass is reheated and made into lamps and "ancient" Chinese curios, snuff bottles, etc.

All of this material is collected by private enterprise, and the sorting is done in the place most convenient for the collector.

Paper, rags, etc., are made into soles for boots and shoes.

HOUSEHOLD WASTE WATERS, ETC.

These are thrown into empty pools at the sides of the streets, and eventually this water is used for street sprinkling. The streets and the passer-by are sprinkled by means of long-handled ladles.

There is an annual appropriation of $300,000 (gold) for sewer repairs. This sum about covers the office expenses.

EXCREMENTITIOUS MATTER.

This is deposited near the sides of streets. All of the material, human or animal, is most carefully collected and used as a fertilizer. It is in the form of sludge, and two large buckets on a wheelbarrow are used to convey it.

The street-refuse collections are made by men and boys with a basket and a small long-handled shovel. The basket hangs on the back from the left shoulder, and great skill is shown by some collectors in scooping up everything and throwing it into the basket without loss. This material is taken to some bright, sunny, convenient locality, mixed with two parts of street dust, and made into cakes the size of an orange. These cakes are sun dried and sold as fertilizers.

The most convenient place for a foreigner to study the details of these methods is the stone bridge on Legation street. It is only a few hundred yards from the two foreign hotels and the French, German, Japanese, English, Russian, and American legations. The bridge being thus centrally located, with a wind-swept stone floor exposed to the sun, possesses all of the requirements of a first-class fertilizer dryer. It is in daily use.

The sewerage system of Pekin is certainly a combined system. Everything combines in the streets. No filters are used. The supply of street sweepings exceeds the demand by about 3 inches in depth. The dead animals are eaten by the dogs.

DUTCH INDIA.

There is little or no system employed here in the disposal of garbage. The waste of animal and vegetable foods is placed in barrels in the back yard of each house, and is removed by carts belonging to Chinamen, who have contracts with the municipality.

It is carted outside the city to vacant land, where it is dumped and allowed to decompose or blow away.

If anyone desires fertilizer, all he has to do is to help himself to whatever in the dump he thinks will best meet his needs.

The pile never seems to accumulate much, as it decomposes in the hot tropical sun, and much is washed away in the rainy season. People also constantly carry away loads to manure their fields and gardens, and Chinamen and natives pick over the pile to see what of value they can find.

Household waste water and excrementitious matter run out from the houses through pipes into one of the canals with which all the cities here are liberally intersected, and thence flow into the ocean, or if the town is inland, into the river. These canals, therefore, as can be well imagined, have about the consistency of pea soup, and are, especially at night and in the dry season, very malodorous.

Street sweepings are collected by the municipality by convict labor, and are dumped outside the city.

The roads are practically all macadam, so most of the sweepings blow into the houses in the form of fine and evil-tasting dust before the city carts get around. In the rainy season the whole place is ankle deep in water, and everything goes into the canals by the quickest route possible—through your house, if you don't build it high enough up. Waste from factories also passes into the canals.

Abattoir refuse is generally buried, unless small, in which case the canal takes it.

As regards dead animals, if you find one on your place, you pay a native a few cents to bury it. The chances are, if he is not watched, he will throw it in the canal.

Batavia has about 175,000 people; Sourabaya has about 250,000 people; Samarang has about 50,000 people. All have the same system, or rather lack of system.

SIDNEY B. EVERETT, *Consul.*

BATAVIA, *April 7, 1898.*

JAPAN.

HIOGO.

I have to acknowledge the receipt of circular dated January 20 last.

The disposal of garbage, sewage, etc., at this port being effected only by the most primitive methods, I have concluded that a report would be of no value to the Department.

SAMUEL S. LYON, *Consul.*

HIOGO, *March 21, 1898.*

YOKOHAMA.

With the exception of night soil, no scientific methods have been adopted to any appreciable extent in the disposition of garbage, sewage, etc., in the cities and towns within this consular district. Drainage is generally very defective, but improvements are gradually being made, based upon foreign models.

In the utilization of night soil, the Japanese, from the earliest times, have been most thorough. Farmers and coolies collect this article from habitations at all hours, in some cases even paying for the privilege. Large wooden buckets with closed tops are generally used for the purpose, and the material is stored by the farmers in reservoirs close to the fields, to which it is applied from time to time in a semiliquid form.

Other garbage and refuse, not carried off by drains, is carted to dump heaps in the suburbs, unless some of it is suitable, without further manipulation, for manuring purposes.

JOHN F. GOWEY,
Consul-General.

YOKOHAMA, *March 19, 1898.*

KOREA.

The population of this city is between 300,000 and 400,000, including the suburbs outside the inclosing walls. There are no underground drains. Liquid filth lies stagnant in the earthen ditches along the streets till a heavy rain washes it out into a walled creek or sewer, that runs through the center of the city to the distant Han River. Farmers carefully gather up all available sewage in baskets and load it upon the backs of ponies or bulls, to be carried to the farms near the city. These men are not paid for this work; they want the material and gather up all from the closets (which open into the ditches along the street), as well as all droppings upon and along the road. As the houses are but one story in height, and the garbage—except that water-carried—is eagerly sought for and removed, the health of the city seems not to be greatly affected by this system.

HORACE N. ALLEN,
Consul-General.

SEOUL, *April 6, 1898.*

PERSIA.

The cities and towns of Persia not having the advantages of any organized form of municipal administration, many departments considered by us of paramount importance in the system of government have no existence whatever. It might be supposed that even under a despotism where the will of the ruler is absolute, some attention would be paid to the sanitary conditions of the large centers of population. The significance of this for political ends and for purposes of revenue has not yet impressed the minds of those who hold themselves responsible for the order and well-being of this country.

Practically speaking, no town, city, or village in Persia is provided with any drainage or sewerage, consequently all refuse, sludge, dirt, and impurities are allowed to fester and stagnate wherever they happen to collect. Waste spaces, empty shops, and unoccupied yards are made convenient places for depositing rubbish and waste, without the least consideration for the health of the neighborhood. These are the ever-ready vehicles for the spread of disease whenever it assumes a virulent or epidemic form. Each house is, however, provided with a well about 30 feet deep as a receptacle for dirty water and other impurities, and as the soil on which most Persian towns are built consists of sand and gravel, the water quickly filtrates into the earth. These wells are, however, not unfrequently in close proximity to the source of the domestic water supply, and in many cases have direct communication. Water-closets have the same kind of outlet, but at the bottom of the shaft or well a large space is excavated, 6 or 8 feet deep and of 2 or 3 yards radius. These subterranean caverns have no outlet and are never emptied, and frequently exhale a poisonous and fetid effluvia. Dead horses, camels, mules, and donkeys are dragged outside the city boundaries to be devoured by jackals, dogs, vultures, and crows. In Teheran, no means exist for utilizing or rendering profitable for agricultural or other purposes the vast amount of decayed animal or vegetable matter which is cast off every day among its population of possibly 300,000 souls. Empty bottles and broken glass are collected and sold to the glass manufacturers and are worked up into the native wares. Waste paper is bought up by the makers of papier-mâché articles, principally pen cases and fancy book covers, and by the bookbinders and makers of fireworks. Empty cans are used by the tin workers for little odds and ends. Zinc lining for cases is made into metal decanters for drinking water. Rags and bones and other bits and scraps of household waste find no useful destination and only go to swell the rubbish heaps.

In Ispahan and some of the southern towns where opium, tobacco, and cotton are raised, sewage and filth from cesspools and other receptacles are collected and used for fertilizing purposes; and at Ispahan, where a large trade is carried on in printing cotton goods, substances strongly impregnated with alkaline and ammoniacal properties are turned to useful account.

In making a survey of the ultimate destination of the refuse, sewage, garbage, and general waste of this country it does not appear that there is anything from which we can extract either useful or profitable information. In this respect, no attempt has been made to adopt new methods or to make improvements on the old. As it was, so it is now and ever will be, is the only conclusion to which it seems possible to come.

JOHN TYLER,
Vice-Consul General in Charge.

TEHERAN, *April 25, 1898.*

STRAITS SETTLEMENTS.

Consul-General Pratt writes from Singapore, April 5, 1898:

In January, 1893, the municipal engineer of Singapore proceeded under instructions to British India, for the purpose of studying the sewerage system in use in the chief towns of that country, and after having visited Rangoon, Calcutta, Benares, Lucknow, Cawnpoor, Agra, Delhi, Meerut, Umballah, Amritsir, Lahore, Jeypoor, Bombay, and Madras, transmitted a report on the sanitary arrangement of these towns with proposals for the sanitation of Singapore.

This report, which I think can not fail to prove of interest, especially in its bearing upon the question in our own subtropical cities, I forward under separate cover, accompanied by the administration report of the Singapore municipality for 1896, and by-laws for the removal of night soil, etc.[1]

The following extracts, showing the deductions drawn from Indian experiences, are from the engineer's report:

> That the final disposal of the solids by trenching is not a satisfactory method for large towns, though it may with safety be adopted for small towns where large areas of trenching land are available, and where crops can be taken off before re-trenching.
>
> That pitting, that is, burying the solids and removing the resulting earth for enriching the soil of gardens or fields, is highly objectionable and dangerous in all cases.
>
> That sewage farming, judging from the working of the Madras farms, might, with advantage, be adopted as a method for the disposal of liquid sewage in many towns in the East, especially those where it could be carried to the lands to be farmed by gravitation without the intervention of pumping.
>
> That liquid sewage with us, being practically free from excremental matter, would not be nearly so valuable for manuring purposes as it is in most Indian towns.
>
> That the small amount of water used per head of population in many of the Indian towns renders the flushing of surface drains difficult, as compared with a town like Singapore, where the consumption per head is large.
>
> That for this reason, and also because the surface drains in Indian towns are not, as a rule, laid down as a complete system, and because the system of shafts allows most of the urine to escape to them, and also because the drains are not generally rendered with cement to prevent percolation, surface drainage is more objectionable than it is with us.
>
> That the water-closet system in India, even in towns that have systems of water-borne drainage, or for which that system is proposed, is not favorably looked upon by the inhabitants, and that the authorities (Rangoon excepted) do not encourage its adoption, evidently from doubts as to its successful management by the natives.
>
> That surface drainage, even when carrying urine, is not looked upon by many of the authorities with disfavor, the advantages of simple inspection and rectifying defects by scavenging and flushing being fully recognized.
>
> Simple surface drainage for sulliage and rain water, and the pail system for excremental matter (to be used either in its state as collected, or manufactured into poudrette, as manure), is in most cases preferable to the dual system which obtains in some towns in India and is proposed in others—a costly system of underground drainage, with its attendant danger, sewage gas, for sulliage and urine, and the maintenance of an enormous scavenging staff to collect the solids at receiving depots and flush them into the underground sewers.
>
> That in flat-lying and tide-locked towns, such as Singapore, where an underground gravitating system of drainage is practically impossible, the adoption of a system of surface drainage for sulliage and storm water, and the pail system for excreta, is undoubtedly the best system to be adopted.

SYRIA.

The city of Beirut has a population of nearly 125,000, composed of several nationalities, the European element forming a small proportion compared with the native citizens.

The garbage collected in this locality contains, in addition to the waste of animal and vegetable foods, a considerable quantity of leather refuse, broken glass and earthenware, house sweepings, and rotten fruits. The amount of material collected is approximately 60 cart loads per diem. The great bulk of this garbage is collected early every morning by the carts belonging to the city (12 in number), hauled beyond the city limits, and dumped either into the sea or the neighboring fields. Farmers and gardeners are also allowed, without paying any fee to the muncipal council, to send around donkeys carrying large baskets or bags made of reed or palm leaves, which the drivers fill with what refuse they choose from the dunghills, with a view to its use as fertilizer.

---

[1] Forwarded to Department of Agriculture.

The municipality, which is responsible for keeping the city clean and in good condition, expends the sum of about 100,000 piasters ($4,400) annually for the removal of garbage.

The said material is reckoned by the city authorities to have no value whatever, and, as stated above, it is dumped into the sea or in the fields outside of the inhabited quarters of the city. This method has been in use for the last twenty years.

None of the garbage of Beirut is cremated or treated in any way for the manufacture of grease or fertilizer. What goes into the hands of farmers or gardeners is kept in a heap until it is sufficiently decayed to be used as manure.

In the cities of this consular district, no systematic methods are in use for the collection and utilization of old tin cans, bottles, broken glass and crockery, ashes, sawdust, floor sweepings, grease, paper, or any other coarse rubbish, except rags and bones, which are usually gathered for exportation to Europe.

No disposition is made of household waste water from the kitchen, laundry, and chambers. It is usually led through tin pipes into a cesspool or ditch. In Damascus, most of the houses connect their kitchen drains with public sewers, which empty into a river and discharge outside of the city walls.

Only in the city of Damascus is the water system in use for the removal of excrementitious matter. At Beirut and the other important cities in Syria a separate sewer system, more or less complete, is used, while at Damascus the combined one is adopted, as stated above. Damascus has a population of about 250,000. No pumps are employed for delivering the sewage at the place of disposal. The sewage is not used for the irrigation of cultivated land in this part of the Turkish Empire. It does not receive any treatment. Filter beds are unknown in this country.

STREET SWEEPINGS.

The method used for the collection, removal, and disposal of street sweepings is a very simple and economical one. The municipal council in each city supplies sweepers for the cleaning of the various quarters of the city. In each quarter, a chief sweeper oversees the men under his charge. Every morning at an early hour two or three sweepers go round in each quarter, sweep the streets, and deposit the refuse in a car that follows them. When the car is full, the carman drives his mule to the seashore, or to a secluded spot outside of the precincts of the city, and discharges his load. The cost of collection, removal, and final disposal of the street sweepings amounts at Beirut to about $4,400 per year. The same work costs the municipality of Damascus about $13,200.

Most of the streets, both in Damascus and Beirut, are either roughly paved with stone or macadamized.

There are no official regulations in Turkey governing the waste of factories. In fact, no factories other than those for spinning silk are in operation in Syria.

MARKET AND ABATTOIR REFUSE.

The method employed for the disposal of market and abattoir refuse is to gather the same, mix it with earth, sawdust, or other drying material, and then haul it to the fields, where it is used as fertilizer.

The only disposition made of dead animals by the municipality is to haul them to the sands outside of the city, or dump them into the sea.

No method is used for the industrial or agricultural utilization of the carcasses of dead animals anywhere in Syria. The birds of prey and the dogs alone derive any benefit from them.

THOMAS S. DOYLE, *Consul.*

BEIRUT, *March, 1898.*

AUSTRALASIA.

NEW SOUTH WALES.

In response to circular of January 20 last, I would respectfully reply that as yet no scientific means are employed to dispose of street garbage, nor is such matter in any way utilized, except that the stable manures are mostly collected by Chinamen, as fertilizers for gardens.

The fluid and waste passing through the sewers run into the sea several miles from the city. The offal from the abattoirs is taken into punts and emptied also into the sea, a few miles outside Sydney Heads. The street cleanings and common refuse from buildings are loaded in carts and dumped in hollows, gulches, and depressions in the suburban districts, where they help to fill in and improve the land.

The question of scientific treatment is now engaging the attention of the city council, and the purchase of an English cremator is being negotiated. In this new country, there is little hope of the valuable utilization of any part of this refuse, and the main object in the change of methods is to improve the sanitary condition of the city.

I made every effort to induce the authorities to investigate the most recent devices in our country, and the city surveyor, who was sent abroad to gather information on the subject, promised me he would visit New York and Chicago, but he seems to have overlooked the rest of the world in his admiration for certain English appliances.

A refuse destroyer seems to be what is desired in Sydney, and the contrivance that will the most cheaply, speedily, and effectually destroy all manner of street garbage is what is being considered by the city fathers.

GEO. W. BELL, *Consul.*

SYDNEY, *March 31, 1898.*

NEW ZEALAND.

Referring to circular letter of January 20 last, I beg to state that the matter is not treated by modern scientific measures in my district, and no report on the same would be of special interest. In its issue of March 26, the Auckland Morning Herald, in an exhaustive article on "Our city and its resources," said:

> Nature has done much for Auckland. Man has done little, and what he has done he has done badly. He has laid out the city abominably, he has built it vilely, and his roadmaking is a byword among the cities of the south. The blame for all this lies at the door of the city council, but primarily it rests with the citizens themselves. For many years past, they have apparently ceased to take any interest in municipal affairs or to feel a pride in their city. The result of this widespread apathy has been in a sense disastrous, in that it has allowed the administration of the municipal affairs of the city to be conducted in any fashion without protest. It is scarcely surprising, therefore, to find that the city has grown up in its present higgledy-piggledy condition, without beauty, order, or form; that its streets are dirty and badly made; that its water supply is insufficient; that its drainage is imperfect; that its method of removing and disposing of night soil is primitive, pestiferous, and a danger to the public health; that there is no adequate sanitary inspection; no esplanades; no central market for disposal of fish, fruit, poultry, dairy and farm produce. The list might be indefinitely prolonged, but there is no necessity to amplify it.

Auckland is, without doubt, one of the dirtiest cities in the world. I attribute this in part to the fact that most of its streets are macadamized and covered with volcanic gravel or rock, making a very fine dust, which is whirled through the air at times in such quantities as to blind both man and beast. Its sewerage is limited and the most primitive imaginable. If the same enterprise were shown by the people of this city that one finds in American centers of the same population, Auckland could be made a city of great beauty.

FRANK DILLINGHAM, *Consul.*

AUCKLAND, *March 31, 1898.*

FOREIGN TRADE IN COAL TAR AND BY-PRODUCTS.

CIRCULAR.] DEPARTMENT OF STATE,
Washington, October 10, 1898.

To the Consular Officers of the United States.

GENTLEMEN: With a view of entering into the foreign trade in coal tar and its by-products, the New England Gas and Coke Company has requested the Department to secure, through the good offices of its consuls, statistics covering the imports into and exports from the several countries, together with the prices, of the following articles: Coal tar; light and heavy oils, being distillates of tar; tar asphalt; tarred roofing felt, tarred paper, and asphalt paper; paving pitch; tar coke, pitch coke, and petroleum coke; coal-tar pitch, hard and soft; carbolic oil and carbolic acid, crude and refined; creosote oil; solvent naphtha; anthracene oil; green and red oils; naphtha and tar naphtha; benzole and benzine, 90 per cent, 50 per cent, and 35 per cent; toluene and toluole; xylene and xylole; naphthalene and anthracene; cresylic acid; aniline and lucigen oils; huile siderale; lubricating oils from coal tar; lampblack; wood preservatives and wood cement; marine glue.

It is said that large quantities of the crude materials are exported from Great Britain to Germany, where they are manufactured into aniline dyes, etc., in which form they are returned to Great Britain in equally large quantities for use in a variety of industries. Statistics covering this phase of the trade—the import of the crude material for manufacture—are particularly desired.

As the statistics required by the New England Gas and Coke Company relate to countries at large, this inquiry is only sent to consuls-general. Where there is no consul-general in a country, the inquiry is sent to the consul having the best facilities for securing the desired information.

Officers will therefore prepare their reports accordingly. It is thought that this information can be secured from the national customs of the several countries without much trouble.

I am, gentlemen, your obedient servant,

THOS. W. CRIDLER,
Third Assistant Secretary.

EUROPE.

AUSTRIA-HUNGARY.

I have the honor to report, in reference to the trade in Austria-Hungary in coal tar and its by-products, that the statistics of the imports and exports of coal tar and its by-products have been compiled by the Austrian customs in the following manner. These articles are incorporated, for the most part, under the general title of mineral oils, which also include brown coal tar and slate tar.

Imports by countries.

MINERAL OILS, CRUDE, HEAVY.

German Empire	$38.00
Roumania	5,111.20
Russia	626,554.00
Trieste (free zone)	2.80
Total, 1897	631,706.00
1896	895,304.00
1895	1,658,130.00
1894	1,439,883.60
1893	1,654,924.00

By sea:	
Russia	529,334.40
Trieste (free zone)	2.80
Total, 1897	529,337.20
1896	726,411.20
1895	1,365,124.40
1894	1,266,315.60

MINERAL OILS, CRUDE, HEAVY.

Roumania:	
1897	$188,574.00
1896	200,997.20
1895	215,409.60
1894	194,624.00
1893	163,627.20

MINERAL OILS, CRUDE, LIGHT.

United States of America:	
1897	$88,221.60
1896	32,690.00
1895	157,596.00
1894	137,576.40
1893	113,887.60

MINERAL OILS, CRUDE, LIGHT—cont'd.

By sea:	
1897	$88,221.60
1896	32,690.00
1895	157,596.00
1894	137,576.40

MINERAL OILS, CRUDE, FOR ILLUMINATING PURPOSES.

German Empire	$10.80
Italy	2.40
Total, 1897	13.20
1896	10.40
1895	91.20
1894	218.40
1893	698.00

By sea, Italy:	
1897	2.40
1896	2.80

MINERAL OILS, REFINED OR HALF REFINED, HEAVY, DARK.

United States of America	$11,815.20
America (not otherwise specified)	160.80
German Empire	858.00
Russia	104,530.80
Total, 1897	117,363.80
1896	72,887.60
1895	84,442.80
1894	74,741.60
1893	79,106.40

MINERAL OILS, REFINED OR HALF REFINED, HEAVY, DARK—continued.

By sea:	
United States of America	$110.40
Russia	90,255.20
Total, 1897	90,365.60
1896	52,740.00
1895	45,002.80
1894	34,582.80

MINERAL OILS, REFINED OR HALF REFINED, LIGHT (IN COLOR), HEAVY.

United States of America	$2,425.20
Belgium	5.20
German Empire	277.60
Great Britain	220.00
Hamburg (free zone)	77.60
Norway	5.20
Russia	72,952.40
Trieste (free zone)	37.60
Total, 1897	76,000.80
1896	92,952.80
1895	98,122.00
1894	92,994.40
1893	54,117.60
By sea:	
United States of America	151.20
Great Britain	210.00
Hamburg (free zone)	35.20
Russia	48,322.40
Trieste (free zone)	37.60
Total, 1897	48,756.40
1896	47,380.40
1895	67,820.40
1894	64,630.80

MINERAL OILS, REFINED OR HALF REFINED, DARK, LUBRICATING OILS.

United States of America	$147,837.20
America (not otherwise specified)	524.00
Belgium	152.00
British India	52.80
France	65.20
German Empire	5,751.20
Great Britain	1,001.20
Greece	266.80
Hamburg (free zone)	5,476.00
Italy	393.60
Netherlands	180.00
Roumania	1,649.20
Russia	$107,856.80
Sweden	28.00
Switzerland	145.60
Turkey	1,358.00
Total, 1897	272,737.60
1896	238,955.60
1895	218,952.80
1894	205,994.80
1893	232,851.20
By sea:	
United States of America	11,072.00
America (not otherwise specified)	251.20
France	40.40
German Empire	28.00
Great Britain	483.60
Greece	9.20
Hamburg (free zone)	98.80
Italy	347.20
Russia	21,529.60
Turkey	1,358.00
Total, 1897	35,218.00
1896	19,601.60
1895	28,041.60
1894	48,587.20

MINERAL OILS, REFINED OR HALF REFINED, LIGHT.

United States of America	$114,366.40
America (not otherwise specified)	1,915.20
Belgium	597.60
Brazil	16.80
France	16.80
German Empire	4,508.40
Great Britain	91.20
Hamburg (free zone)	408.00
Italy	3,120.80
Netherlands	19.20
Roumania	14.40
Russia	511.20
Switzerland	1,015.20
Trieste (free zone)	14.40
Turkey	2.40
Total, 1897	126,617.20
1896	116,480.00
1895	164,942.40
1894	141,998.00
1893	122,836.00

MINERAL OILS, REFINED OR HALF REFINED, LIGHT—continued.

By sea:	
United States of America	$1,606.80
America (not otherwise specified)	14.40
Italy	5.20
Russia	264.00
Trieste (free zone)	14.40
Turkey	2.40
Total, 1897	1,907.20
1896	1,594.00
1895	6,016.80
1894	6,026.00

COAL-TAR PITCH.

German Empire	$39,840.00
Great Britain	294.00
Italy	42.00
Total, 1897	40,176.00
1896	14,490.00
1895	7,486.00
1894	7,918.00
1893	32,702.00
By sea:	
1896	10.00
1895	48.00
1894	10.00

COAL-TAR OILS.

German Empire:	
1897	$3,001.60
1896	7,666.40
1895	873.60
1894	1,682.80
1893	1,974.00

ANILINE OIL.

France	$1,382.40
German Empire	74,844.00
Great Britain	23,322.00
Italy	172.80
Switzerland	1,468.80
Total, 1897	101,190.00
1896	86,739.20
1895	64,280.00
1894	69,448.80
1893	64,488.00
By sea, Great Britain:	
1897	4,914.00
1896	3,364.00
1895	2,820.00
1894	4,628.40

CARBOLIC ACID, CRUDE; CREOSOTE FROM COAL TAR, PITCH, AND CREOSOTE OIL, CRUDE.

German Empire	$7,952.00
Great Britain	12.00
Russia	12.00
Total, 1897	7,976.00
1896	5,956.00
1895	6,636.00
1894	12,196.00
1893	31,548.00

NITROBENZOLE.

France	$20.40
German Empire	2,020.40
Great Britain	100.80
Hamburg (free zone)	20.40
Total, 1897	2,162.00
1896	2,669.20
1895	2,505.60
1894	2,720.00
1893	2,856.00

ANTHRACENE, CRUDE.

1896	$64.80
1895	892.80

NAPHTHALENE, CRUDE.

German Empire	$102.00
Italy	70.00
Total, 1897	172.00
1896	86.00
1895	28.00
1894	64.00
1893	84.00

CARBOLIC ACID, PURE, SOLID, AND SOLVENT; CREOSOTE FROM COAL TAR, AND CREOSOTE OIL, PURIFIED.

German Empire	$10,304.00
Great Britain	608.00
Total, 1897	10,912.00
1896	8,864.00
1895	6,129.20
1894	16,240.40
1893	152,376.00
By sea:	
German Empire	64.00
Great Britain	384.00
Total, 1897	448.00
1896	192.00
1895	277.20
1894	522.00

TAR DYES, ANILINE, ANTHRACENE, NAPHTHALENE, ETC.

German Empire:	
1897	$234.00
1895	702.00
1894	704.00
1893	1,512.00

DITTO, BY TREATY.

Belgium	$1,944.00
France	11,952.00
German Empire	1,403,424.00
Great Britain	13,680.00
Italy	936.00
Netherlands	1,656.00
Russia	$360.00
Servia	144.00
Switzerland	110,304.00
Total, 1897	1,544,400.00
1896	1,380,024.00
1895	1,339,920.00
1894	1,332,080.00
1893	1,063,392.00
By sea, German Empire:	
1897	3,888.00
1896	360.00
1895	
1894	4,032.00
1893	1,360.00

Treated in like manner, the exports for the articles just specified are:

MINERAL OILS, CRUDE.

Bulgaria	$4.00
France	2.00
German Empire	5,932.00
Great Britain	98.80
Hamburg (free zone)	.80
Italy	6,504.80
Netherlands	106.80
Roumania	24.00
Servia	45.20
Switzerland	2,645.60
Total, 1897	15,364.00
1896	20,724.40
1895	21,737.60
1894	13,646.80
1893	8,582.40
By sea, Italy:	
1897	5.60
1896	118.00
1895	190.80
1894	5.60

MINERAL OILS, REFINED.

Belgium	$1,031.20
Brazil	2.80
Bulgaria	20.00
Egypt	2.80
France	348.40
German Empire	126,299.20
Great Britain	11.60
Italy	993.60
Montenegro	2.80
Netherlands	1,604.40
Roumania	73.60
Russia	203.20
Servia	$876.40
Switzerland	78,912.00
Trieste (free zone)	4,114.80
Turkey	2.80
Total, 1897	213,699.60
1896	397,426.80
1895	112,049.20
1894	5,402.00
1893	7,052.80
By sea:	
Egypt	2.80
Great Britain	5.60
Trieste (free zone)	4,114.80
Total, 1897	4,123.20
1896	17,411.20
1895	426.40
1894	632.40

LUBRICATING OILS.

British India	$8.80
Bulgaria	686.40
Egypt	8.80
German Empire	14,656.00
Great Britain	866.80
Greece	8.80
Hamburg (free zone)	39.60
Italy	6,120.00
Netherlands	8.80
Roumania	158.40
Russia	13.20
Servia	6,230.40

LUBRICATING OILS—continued.

Switzerland	$20,976.00
Trieste (free zone)	853.60
Total, 1897	50,627.60
1896	13,601.20
1895	16,244.80
1894	9,023.60
1893	13,669.60
By sea:	
British India	8.80
Egypt	8,80
Greece	8.80
Italy	2,800.00
Trieste (free zone)	853.60
Total, 1897	3,680.00
1896	2,680.40
1895	471.60
1894	143.20

BENZINE.

United States of America	$1,466.00
Belgium	148.40
Bremen (free zone)	8,625.60
Bulgaria	306.80
France	3,318.00
German Empire	272,105.60
Great Britain	4,149.60
Hamburg (free zone)	5,840.00
Italy	3,648.40
Netherlands	701.60
Roumania	224.00
Russia	10.00
Servia	63.20
Switzerland	32,446.00
Trieste (free zone)	7,048.00
Turkey	7.20
Total, 1897	340,108.40
1896	284,952.00
1895	195,552.80
1894	77,286.00
By sea:	
Great Britain	4,149.60
Italy	7.20
Trieste (free zone)	4,048.00
Total, 1897	11,204.80
1896	7,522.80
1895	155.60
1894	156.80

TAR OF ALL KINDS EXCEPTING BROWN COAL AND SLATE TAR.

Africa	$8.40
Belgium	141.60
British Possessions in the Mediterranean	141.60
Bulgaria	1,108.80
Egypt	901.20
German Empire	49,422.00
Greece	214.80
Hamburg (free zone)	1,689.60
Italy	2,864.40
Montenegro	1.20
Netherlands	2.40
Roumania	476.40
Russia	6.00
Servia	538.80
Switzerland	280.80
Turkey	320.40
Total, 1897	58,118.40
1896	53,874.40
1895	37,569.20
1894	37,358.00
1893	31,710.00
By sea:	
Africa	8.40
British Possessions in the Mediterranean	141.60
Egypt	901.20
Greece	214.80
Italy	1,112.40
Roumania	51.60
Turkey	272.40
Total, 1897	2,702.40
1896	2,382.00
1895	1,952.00
1894	3,053.20

PITCH.

United States of America	$39.20
Belgium	5.20
Bremen (free zone)	93.60
Bulgaria	632.00
Egypt	65.20
France	2.80
German Empire	22,833.20
Greece	164.00
Hamburg (free zone)	1,822.40
Italy	1,934.40
Roumania	946.40
Russia	2,649.20
Servia	1,801.60
Switzerland	288.40

PITCH—continued.

Trieste (free zone)	$5.20
Turkey	200.00
Total, 1897	33,482.80
1896	34,803.60
1895	246,933.60
1894	32,782.40
1893	67,900.80
By sea:	
Bulgaria	33.60
Egypt	65.20
Greece	164.00
Italy	1,185.60
Trieste (free zone)	5.20
Turkey	182.00
Total, 1897	1,635.60
1896	1,856.00
1895	4,803.20
1894	2,208.00

ANILINE OILS.

German Empire:	
1897	$1,680.00
1896	720.00
1895	22.00
1894	324.80
1893	96.00

CARBOLIC ACID, CRUDE; CREOSOTE FROM COAL TAR, AND CREOSOTE OIL, CRUDE.

Bulgaria	$76.80
German Empire	112.00
Italy	88.40
Roumania	1,652.00
Servia	979.60
Turkey	11.60
Total, 1897	2,920.40
1896	2,741.60
1895	1,445.60
1894	1,396.00
1893	5,660.00
By sea, Turkey:	
1897	11.60
1896	752.40
1895	210.40
1894	286.80

NITROBENZOLE.

1896	$336.00
1894	245.20
1893	70.00

ANTHRACENE, CRUDE.

German Empire:	
1897	$4,560.00
1896	12,344.00
1895	11,866.40
1894	14,896.00
1893	14,778.00

NAPHTHALENE, CRUDE.

British India	$396.80
Bulgaria	1,177.60
Egypt	48.00
German Empire	3.20
Greece	518.40
Italy	48.00
Montenegro	3.20
Roumania	201.60
Russia	486.40
Servia	716.80
Switzerland	3.20
Trieste (free zone)	38.40
Turkey	2,710.40
Total, 1897	6,352.00
1896	5,008.00
1895	5,107.20
1894	5,680.00
By sea:	
British India	396.80
Bulgaria	16.00
Egypt	48.00
Greece	518.40
Italy	48.00
Trieste (free zone)	38.40
Turkey	2,710.40
Total, 1897	3,776.00
1896	3,017.60
1895	3,856.00
1894	3,736.00

CARBOLIC ACID, PURE, SOLID, AND SOLVENT; CREOSOTE FROM COAL TAR AND CREOSOTE OIL, PURIFIED.

Bulgaria	$576.00
German Empire	3,584.00
Greece	192.00
Hamburg (free zone)	32.00
Roumania	1,888.00
Servia	544.00
Turkey	224.00
Total, 1897	7,040.00
1896	3,960.00
1895	9,100.80
1894	4,672.00
1893	11,744.00

CARBOLIC ACID, PURE, SOLID, AND SOLVENT; CREOSOTE FROM COAL TAR AND CREOSOTE OIL, PURIFIED—continued.

By sea:	
Greece	$192.00
Turkey	224.00
Total, 1897	416.00
1896	870.00
1895	2,822.40
1894	96.00

TAR DYES, ANILINE, ANTHRACENE, NAPHTHALENE, ETC.

Belgium	$80.00
British India	21,200.00
Bulgaria	3,520.00
Egypt	160.00
France	80.00
German Empire	30,400.00
Greece	400.00
Italy	10,160.00
Japan	80.00
Mexico	80.00
Roumania	$1,040.00
Russia	20,640.00
Servia	3,600.00
Switzerland	1,120.00
Turkey	7,040.00
Total, 1897	99,600.00
1896	114,900.00
1895	75,920.00
1894	73,968.00
1893	111,320.00
By sea:	
British India	21,200.00
Bulgaria	80.00
Egypt	160.00
Greece	400.00
Turkey	6,560.00
Total, 1897	28,400.00
1896	56,880.00
1895	35,840.00
1894	35,808.00

The wholesale prices in Vienna of the articles enumerated are as follows:

Coal tar, per 220 pounds (exclusive of barrels)	$0.812
Light and heavy oils, being distillates of tar, per 220 pounds (including barrels)	2.03
Tar asphalt, per 220 pounds	.812
Tarred roofing felt, tarred paper, and asphalt paper, per square yard	.03–0.07
Paving pitch, per 220 pounds	.812
Tar coke, pitch coke, and petroleum coke, per 220 pounds	1.40–1.65
Coal-tar pitch, hard and soft, per 220 pounds	.73–0.81
Carbolic oil, crude, per 220 pounds	2.43
Carbolic oil, refined, per 220 pounds	34.11
Carbolic acid, crude, per 220 pounds	.81
Carbolic acid, refined, per 220 pounds	12.18
Creosote oil, per 220 pounds	1.62
Solvent naphtha, per 220 pounds	.487
Anthracene oil, per 220 pounds	2.23
Green oil, per 220 pounds	1.52
Red oil, per 220 pounds	2.436
Naphtha and tar naphtha, per 220 pounds	.51
Benzole, per 220 pounds	1.70
Benzine, per 220 pounds	6.09
Toluene and toluole, pure, per 220 pounds	30.45
Xylene and xylole, pure, per 220 pounds	32.48
Anthracene, per 220 pounds	4.06
Naphthalene, pure, per 220 pounds	4.87
Cresylic acid, brown, per 220 pounds	10.55
Cresylic acid, yellow, per 220 pounds	12.18
Lubricating oil	1.21
Lampblack, per 220 pounds	14.21
Wood preservative and wood cement	2.00–2.23

Huile siderale and marine glue are not known on the Austrian market.

It is interesting to note further the great increase in the imports of aniline dyes from Germany into Austria-Hungary, which in 1889 amounted to $1,240,000 and in the year 1897 to $2,520,000.

CARL BAILEY HURST,
Consul-General.

VIENNA, *November 19, 1898.*

BELGIUM.

I have the honor to state, in reply to the circular of the Department dated October 10 last, demanding detailed information as to the trade in coal tar and its by-products in this country, that no statistics are furnished by the customs officers of the Kingdom concerning either the export or import of the derivatives of either tar or pitch. It was ascertained by me at the ministry of finance that nothing whatever was known of either the quantity or the value of the derivatives of the substances mentioned in import or export. The same was the case with the department of public works, and it has been only through the assistance of influential friends that it has been possible for me to obtain the information hereinafter given, which, while it does not answer to the fullest extent the requirements of the circular in question, still covers all that is obtainable from any source in this country, and touches upon all the derivatives of the product known to the trade here.

Under the heading of importations of tar, asphalt, pitch, residuum of coal tar, etc., the ministry of finance publishes the following statistics of the quantity and value of the same imported and exported for the calendar year 1897.

In the tables herewith submitted will be found the figures both for the general and special commerce, the quantities being expressed in pounds avoirdupois and the value in United States currency:

IMPORTS.

Countries.	Quantity.		Value.	
	General commerce.	Special commerce.	General commerce.	Special commerce.
Algeria	2,728,271	2,728,271	$59,492	$59,492
Germany	32,033,572	29,435,292	701,088	643,822
England	239,551,038	239,223,294	5,264,724	5,235,656
Bremen	1,101,817	1,079,473	24,114	23,625
Denmark	1,130,355	1,130,311	24,739	24,613
Spain	2,678,137	2,678,137	58,613	58,613
Congo	104,985	104,985	2,297	2,297
United States	65,490,087	64,303,714	1,433,219	1,407,354
France	55,144,116	54,491,301	1,206,887	1,182,884
Hamburg	4,559,218	4,541,275	99,783	99,390
Dutch Indies	111,689	110,699	2,444	2,422
Norway	999,010	999,010	21,864	21,864
Holland	30,926,276	29,309,802	676,854	642,789
Russia	85,325,453	85,324,294	1,867,437	1,867,412
Sweden	6,904,787	6,684,636	151,118	148,489
Switzerland	517,216	515,419	11,319	11,282
Turkey	332,895	332,895	7,285	7,285
Other countries	606,562	590,237	13,265	12,918

The statistics of exports derived from the same source and for the corresponding period are:

EXPORTS.

Countries.	Quantity.		Value.	
	General commerce.	Special commerce.	General commerce.	Special commerce.
Germany	129, 645, 894	129, 142, 624	$2, 837, 437	$2, 826, 422
England	8, 388, 425	8, 283, 244	183, 589	181, 287
Australia	255, 138	220, 272	5, 584	4, 820
Brazil	855, 805	831, 814	18, 732	6, 262
Canada	272. 111	271, 606	5, 955	5, 944
Denmark	925, 394	893, 314	20, 253	19, 551
Egypt	1, 093, 254	1, 090, 939	23, 926	23, 876
Spain	2, 778. 294	2, 771, 875	60, 805	50, 577
Congo Free State	270. 502	247, 142	5, 920	5, 408
United States	6, 539, 608	5, 656, 251	141, 124	123, 793
France	32, 887, 105	20, 691, 676	719, 768	649, 833
Luxembourg	1, 185, 611	1, 084, 971	25, 948	23, 745
Hamburg	1, 500, 203	1, 496. 797	32, 833	32, 759
Italy	916, 419	911, 227	20, 056	19, 943
Norway	918, 359	918, 359	20, 099	20, 099
Holland	11, 425, 399	9, 645, 907	250, 056	213, 277
Portugal	821, 793	793, 038	17, 985	17, 356
Argentina	241, 831	218, 570	5, 292	4, 783
Roumania	359, 601	359. 601	7, 870	7, 870
Russia	1, 379, 958	1, 266, 346	30, 201	27, 715
Sweden	1, 384, 438	137, 268	30, 209	80, 032
Switzerland	6, 603. 833	6, 457, 343	144, 531	141, 825
Turkey	229, 880	224, 410	5, 031	4, 911
Other countries	736, 425	680, 575	16, 017	14, 894

The average prices of Belgian manufacturers for the derivatives of coal tar, so far as here known, are as follows (per 220 pounds):

Sulphite of ammonia		$4. 82
Benzole, 90°		4. 82
Naphtha	$6. 75 to	7. 72
Phenic acid		9. 65
Creosote	1. 35	1. 93
Raw naphthalene	1. 06	1. 25
Anthracene	13. 51	15. 44
Brai (residuum of coal tar)	. 57	. 77
Toluene	6. 75	7. 72
Pyridine		24. 12

ASPHALT.

The asphalt or bitumen known here comprises two varieties, the hard and the soft. The kind first named is comparatively rare in Europe. The second variety, which is found in certain coal districts, is produced in Germany, France, and Switzerland. Asphalt is not produced in Belgium on a commercial scale; that used in this country for paving purposes comes principally from Switzerland (Canton Neufchâtel).

TAR.

Tar is produced, first, from distillation of wood; secondly, from the distillation of coal; thirdly, from the distillation of raw petroleum.

Wood tar.—Wood tar is one of the by-products of the manufacture of acetic acid and methylic alcohol, by distillation of wood. There are in this country four large factories engaged in the manufacture of methylic alcohol and raw pyrolignic acid. One of these factories produces a pure acetic acid; the others manufacture only the different grades of acetate of soda and lime, and sell the same to the manufacturers of vinegar producing actic acid. The above-mentioned factories have no great commercial importance; moreover, the quantity of tar obtainable from the distillation of wood is not large, being in general about 4 per cent. Belgium therefore is not an important producer of this article. The tar is employed in the raw state or further treated to produce creosote or residuum of coal tar. Creosote thus produced (mixture of creosote, phenic acid, etc.) is employed for coating wood, notably of railroad sleepers. Wood tar in the raw state is used to coat the cables employed in mines and cordage of vessels. This product, as well as the residuum of coal tar, is also utilized in the manufacture of the small briquets or patent fuel, which are made up of tar and sawdust.

Coal tar.—This product, obtained from the distillation of coal, is the only one of its kind of any commercial importance in Belgium. It is a by-product of gas works, and for some ten years, of certain coke furnaces. Some years ago, the gas manufacturers sold their tar and ammonia water, the former to distillers of tar, and the latter to manufacturers of chemical products. This ammonia water is largely employed to produce pure ammonia, salts of ammonia, and especially in the manufacture of Solvays soda, known as ammoniacal soda. For some time, several gas manufacturers have prepared the sulphate of ammonia themselves, and a year ago the gas works at Brussels set up a complete tar distillery in which are treated all by-products.

A dozen or more collieries have in the last ten years set up coke furnaces for the purpose of treating their by-products. Five hundred or more such furnaces, most of which are of the Semet-Solvay system, are at present working in Belgium. These factories prepare sulphate of ammonia, raw benzole (light oils), and dispose of the tar remaining to the distilling factories.

Distillation of tar.—In Belgium, there are five factories engaged in the distillation of tar, furnishing annually from 60,000 to 70,000 tons of raw tar, or tar from which benzole has been extracted. The residuum of coal tar thus produced amounts to from 36,000 to 40,000 tons, the same being sold to the manufacturers of briquets, etc. Three of the above-mentioned factories rectify naphthalene. Two other factories are especially adapted for the preparation of raw naphthalene.

Following are the approximate quantities manufactured by the factories concerned:

	Tons.
Sulphate of ammonia	7,000
Naphthalene, pure	4,500
Benzole	3,000
Anthracene oil	600
Phenic acid	90
Heavy oils	7,500
Residuum of coal tar	36,000 to 40,000
Lampblack	50

Small quantities of toluene, cresylic acid, and pyridine.

The heavy oils are prepared in small quantities for naphthalene and phenic acid, the greater part being utilized as a lubricating oil or creosote. Two or three of the Belgian manufacturers purify the benzoles, producing same at 90°, at 50°, and also benzines. With the exception of the anthracene (which is nearly entirely disposed of to German manufacturers of dyestuffs), the products are for the greater part consumed in Belgium.

Petroleum tar.—In the past, raw petroleum has been imported into Belgium, and purified, for the greater part, in Antwerp and vicinity. The Belgian refiners have abandoned that branch of trade, and at the present time all the petroleum consumed in this country is imported in a refined state from Russia and the United States. Two or three small gas works in Belgium still manufacture their gas by means of petroleum tar, is being imported.

CARDBOARD AND TARRED PAPER.

Belgium manufactures annually 1,196,000 square yards of tarred or asphalted cardboard, amounting in value to $67,550. The cardboards used for this purpose are of a woolen or felt character.

Belgium also produces annually about 3,306,900 pounds of waterproofed paper and cloths.

The asphalted or waterproofed paper is usually lined with muslin or canvas; this variety comprises about one-third of the quantity manufactured in Belgium.

GEO. F. LINCOLN,
Consul-General.

ANTWERP, *December 20, 1898.*

DENMARK.

In compliance with the Department's circular of the 10th of October, I have to report that there is no industry in Denmark dealing with tar distillation, as it can not pay in view of the German competition.

Tar is imported into Belgium and Germany from England, and re-exported as finished dyestuffs, pitch, creosote, etc. All dyestuffs, carbolic oils, etc., are imported into Denmark from England and Germany. Lubricating oils come from Russia and America. The Copenhagen bureau of statistics does not keep separate statistics for the articles named in the Department's circular. All the information in this line that I can obtain is that the import to and export from Denmark in 1897 was:

Import:	
Oils	$677,504
Tar	74,236
Pitch	15,276
Export:	
Oils	62,444
Tar	45,024
Pitch	2,412

The tar sold from the gas works in Denmark is used exclusively for making roofing felt and tar paving, the benzols, etc., being lost in the process of boiling down the tar. The Copenhagen gas works manufacture two qualities, i. e., "raw" tar and "centrifuged" tar, the former containing 6 to 8 per cent and the latter about 1 per cent of water. The present price is 6.20 kroner ($1.66) and 6.70 kroner ($1.80), respectively, per barrel of about 190 liters net (1 liter = 1.0567 quarts). These prices are for not less than 500 barrels, and are proportionately higher for smaller lots.

JULES BLOM,
Vice and Deputy Consul.

COPENHAGEN, *November 4, 1898.*

FRANCE.

I beg to acknowledge receipt of Department circular of 10th October, 1898, in reference to the foreign trade in coal tar and its by-products.

The delay in reply to this circular has been due to the fact that the subject is one in regard to which it is very difficult to obtain information in Paris. The market here for coal tar and its by-products is very restricted, and no daily official quotations exist. The prices are practically governed by those from England, and the houses conducting this business in Paris are, for the most part, English.

I submit statistics in regard to the imports into France of petroleum oil and schist for 1897, which are the latest official figures that I am able to quote.

IMPORTATIONS INTO FRANCE OF PETROLEUM OIL AND SCHIST FOR 1897.

Raw, taxed by weight.—The United States furnishes 2,378,472 quintals (234,130 tons, 16 hundredweights) out of a total of 2,378,647 quintals (234,149 tons); the last figures representing a value of 21,408,180 francs ($4,131,778.74), producing a duty revenue of 21,408,702 francs ($4,131,879).

Raw, taxed by volume.—The United States furnishes 174,065 hectoliters (4,595,316 gallons) out of a total of 733,693 hectoliters (19,369,495 gallons), Russia furnishing 559,628 liters (147,339 gallons); the total representing a money value of 5,458,873 francs ($1,053,562), on which was paid a duty of 5,282,584 francs ($1,019,538).

Refined petroleum oil and essences, taxed by volume.—The United States furnishes 211,821 hectoliters (5,592,074 gallons) out of a total of 263,814 hectoliters (6,964,689 gallons); the total representing a value of 2,955,229 francs ($570,359), producing a duty revenue of 2,643,678 francs ($510,229.85).

As regards heavy oils and residue of petroleum, the United States furnishes 197,836 quintals (43,634,925 pounds), out of a total of 508,024 quintals (111,998,971 pounds), representing a value of 6,303,527 francs ($1,216,580.71), producing a duty revenue of 4,631,044 francs ($893,791.49).

Thus, it will be seen that in the special commerce of France in petroleum oils and schist, the United States figures for 2,378,472 quintals (524,355,891 pounds) when measured by weight, and 385,886 hectoliters (10,187,390 gallons) when measured by volume, out of a total of 2,378,687 quintals (524,405,336 pounds) in weight and 997,506 hectoliters (26,334,158 gallons) in volume.

Products obtained directly from the distillation of coal tar (boiled tar)—essence of oil, benzine, benzole, toluene, xylene, heavy oil, naphthalene, anthracene, phenic acid, phenol, carbolic acid—are classified together in the customs tariff and under the general tariff which the United States pays, are exempt, if imported direct from the United States, but pay 3.60 francs (69 cents) per 100 kilos (220.46 pounds), gross weight, if imported from a non-European country through a European depot.

Chemical products derived from products of the distillation of coal tar—nitrobenzine, nitrotoluene, aniline, toluidine, xylidine, naphthol, naphthylamine and their acid combinations; salts of alcoholics, dimethylaniline, diphenylamine, benzoic acid, etc.—are taxed under the general tariffs, if coming direct from the United States to France, at 20 francs ($3.86) per 100 kilos net, and at 23.60 francs ($4.44) if coming from a non-European origin through a European depot. Under the minimum tariff, or that applied to the "most favored nations," the first class above mentioned is exempt. The second pays 15 francs ($2.89) per 100 kilos net.

The official statistics of the French Government show that France exported in 1897 to the United States 1,610 quintals (354,940 pounds) of mineral tar and common black pitch, out of a total export of 213,701 quintals (47,112,522 pounds).

The official figures, as published by the French Government, show that the importations into France of oils and essences of petroleum and schist (not including heavy oils) were, for—

	Francs.	
1897, special commerce	29,800,000 =	$5,751,400
1896, special commerce	32,300,000 =	6,233,900
1895, special commerce	33,800,000 =	6,523,400

JOHN K. GOWDY,
Consul-General.

PARIS, *March 11, 1899.*

GREAT BRITAIN.

Statistics covering the exports and imports of the various articles enumerated in the Department's circular of October 10, 1898, are not available, inquiries in many directions having failed to produce any result.

The prices of coal tar and its by-products are as follows: Refined coal tar, 2½d. (5 cents) per gallon in bulk; coal-tar pitch, medium soft and soft, 25s. ($6.08) per ton in bulk. Crystal carbolic acid, 35° C., 6⅜d. (12.9 cents) per pound; 39–40° C., 6⅞d. (13.9 cents) per pound, 2½-hundred-weight drums and over, casks included. Creosote oil, 2½d. (5 cents) per gallon, in bulk. Solvent naphtha, 1s. 2d. to 1s. 6d. (28.4 to 36.5 cents) per gallon, casks free, according to quality. Anthracene oil (also termed green oil), 2½d. (4.7 cents) to 2¾d. (5.5 cents) per gallon, in bulk. Benzole 90 per cent, 8½d. (17 cents) per gallon, casks free. Toluole, 1s. 2d. to 1s. 6d. (28.4 cents to 36.5 cents) per gallon, casks free, according to quality. Cresylic acid, 11½d. (23.3 cents) per gallon, casks free. Lubricating oils from coal tar (see green oil); wood preservatives (see creosote oil); paving pitch (see coal-tar pitch).

The above-mentioned liquids quoted in bulk are generally shipped in petroleum casks, which cost about 4s. 8d. ($1.13) each, including the cost of filling. Pitch is generally shipped to the United States in glucose or similar casks, which cost about 14s. ($3.40) per ton of pitch, including filling. Benzole, toluole, solvent naphtha, and cresylic acid are packed in petroleum casks; but the three first-named articles, when shipped from here to the States, are generally packed in iron drums of about 100–120 gallons capacity, costing from 35s. to 40s. ($8.52 to $9.73) each.

WM. M. OSBORNE,
Consul-General.

LONDON, *January 26, 1899.*

GREECE.

I have waited about three months for the appearance of a statistical publication that I was assured would be issued in a very short time and would give the desired information, but to-day the advent of that publication seems as far off as ever.

From reliable information picked up here and there, it appears that there is no coal tar imported into Greece, and that the only by-product imported is carbolic acid, which enters in limited quantities (the amount imported annually I am unable to learn), and sells here at 2 drachmas (about 26⅔ cents) per oke (2.84 pounds). The tariff on carbolic acid is 50 leptas (about 6½ cents) per oke.

DANIEL E. MCGINLEY, *Consul.*

ATHENS, *July 13, 1899.*

ITALY.

It is not possible to obtain statistics of the importation of each by-product separately, for the reason that these articles are classified together. The custom duties in Italy being collected on the weight of the merchandise and not ad valorem, a separate record is not kept by the custom-house department for each article, but for the class the article may belong to.

The only recent statistics available are the following for the year 1897: Mineral oils, by-products of tar, importation into Italy, 166,000 tons, of which 68,500 tons came from the United States; carbolic acid, 1,264 tons, largely imported from Germany and England; none from the United States; lampblack, 365 tons, mostly from Germany and England; none from the United States; coloring materials, dyes, aniline, etc., by-products of tar, 22,000 tons, of which 15,000 came from Germany and 5,000 from England; none from the United States.

HECTOR DE CASTRO,
Consul-General.

ROME, *November 7, 1898.*

MALTA.

But little can be said upon the subject of the foreign trade in coal tar and its by-products, as regards Malta. The customs authorities keep no record as to character and value of entries that are admitted free of duty. Coal tar and its by-products would come under this head, and I therefore am unable to give the required statistics as to value and quantity of imports of this nature. It is, however, safe to say that very little, if any, is brought here. The local manager of the Mediterranean Gas Company, which maintains a plant here, informs me that beyond the distillation of coal tar into pitch, which product is wholly consumed here for marine purposes and in the foundations of buildings, nothing is done toward preserving and manufacturing other products. There is no demand, and sending by-products to other countries has been found by experience unprofitable.

JOHN H. GROUT, Jr., *Consul.*

MALTA, *November 5, 1898.*

NETHERLANDS.

As the statistics of imports and exports of the Netherlands only specify the articles tar and pitch and not the by-products, it is impossible to furnish detailed figures of same. The imports of tar and pitch into the Netherlands during the year 1898 amounted to 37,398,000 kilograms

(82,275,600 pounds). The exports amounted to 64,267,000 kilograms (141,387,400 pounds). The following statement shows the imports into and the exports from Germany during the year 1898.

IMPORTS.

	Kilograms.	Pounds.
Alizarin	39,200	86,240
Ammoniac, coal acid	1,578,100	3,471,820
Ammoniac, sulphuric acid	30,253,600	66,557,920
Ammoniac water	14,210,800	31,263,760
Aniline	1,028,600	2,262,920
Aniline oil, aniline salt	728,500	1,602,700
Anthracene	8,026,800	17,658,960
Asphalt resin and wood cement	40,549,500	89,208,900
Carbolic acid	4,043,400	8,895,480
Mineral oil	3,155,500	6,942,100
Naphthalene	4,442,000	9,772,400
Pitch	5,270,000	16,594,000
Mineral lubricating oil	9,702,800	21,346,160
Coal-tar oil, light	5,914,600	13,012,120
Coal-tar oil, heavy	1,999,000	4,397,800
Tar	43,724,900	96,194,780

EXPORTS.

Alizarin	9,320,500	20,505,100
Ammoniac, coal acid	2,795,400	6,149,880
Ammoniac, sulphuric acid	4,082,500	8,981,500
Ammoniac water	14,608,300	32,138,260
Aniline	19,712,300	43,367,060
Aniline oil, aniline salt	12,360,300	2,719,266
Anthracene	5,300	11,660
Asphalt resin and wood cement	33,206,800	73,054,960
Carbolic acid	1,743,200	3,835,040
Mineral oil, lubrical	7,028,000	213,461,600
Naphthalene	841,000	1,850,200
Pitch	4,887,500	10,752,500
Coal-tar oil, light	1,611,600	8,545,520
Coal-tar oil, heavy	6,423,400	14,131,480
Tar	25,252,000	55,554,400

Price quotations in London market, February 18, 1899, of following articles were:

		Marks.	
Coal tar	per ton..	18.30 =	$4.36
Benzole:			
90 per cent	per 100 kilos..	15.63 =	3.72
50 per cent	do....	16.67 =	3.97
Toluole	do....	25.01 =	5.95
Naphtha, 30 per cent	do....	6.20 =	1.48
Carbolic acid for disinsecting purposes	do....	44.02 =	10.48
Creosote oil	do....	5.96 =	1.42
Naphthalene	per ton..	49.20 =	11.71
Anthracene, first quality	per kilos..	.65 =	.15
Anthracene, second quality	do....	.49 =	.116
Coal-tar pitch, free on board, London	per ton,.	24.11 =	5.74

GEORGE J. COREY, *Consul.*

AMSTERDAM, *February 27, 1899.*

RUSSIA.

According to the latest statistics Russia, exported and imported from January 1, 1898, to July 1, 1898, the following articles pertaining to coal tar and its by-products:

EXPORTS.

Articles.	Quantity.	Value.
	Tons.	
Raw naphtha	3,194	$25,235
Vaseline and paraffin	2,871	34,505
Light oils		1,030
Kerosene	371,597	3,857,865
Lubricating oils	63,855	1,344,665
Naphtha residues	29,403	328,055
Total	470,920	5,591,355

IMPORTS.

Coke	193,661	$1,130,940
Coal tar	8,261	167,890
Anthracene, raw	97	1,030
Naphthalene	288	5,665
Carbolic acid	952	53,045
Benzole	10	
Asphalt stone	288	4,120
Solvent asphalt	3,516	78,280
Lubricating oil	288	29,870
Benzine, etc	113	14,420
Total	207,474	1,485,260

W. R. HOLLOWAY,
Consul-General.

ST. PETERSBURG, *December 16, 1898.*

SWEDEN.

It is a very difficult matter to get reliable reports in regard to the imports and exports of coal tar and its by-products in the Kingdom of Sweden. I subjoin, however, a few figures that have been obtained after much labor and trouble.

	Imports.	Exports.	Price per pound.
	Pounds.	*Pounds.*	*Swedish crowns. Cents.*
Coal tar	4,000,000	6,250,000	0.01 =0.0026
Pine tar		11,500,000	0.055=0.0147
Asphalt	8,000,000	14,800	0.02 =0.0053
Roofing felt	2,900,000	250,000	0.15 =0.04
Petroleum	99,000,000		0.07 =0.0187
Marine glue	600,000		0.30 =0.08

The other articles asked for in the circular are not reported in the returns of commerce published by the Kingdom.

EDWARD D. WINSLOW,
Consul-General.

STOCKHOLM, *February 1, 1899.*

NORWAY.

The import into Norway in 1897 of some of the principal articles enumerated in the Department circular of October 10, 1898, was as follows: Coal tar, 4,676 hectoliters (123,446 gallons); tar asphalt, 209,080 kilograms (460,938 pounds); tarred paper, 1,000,000 kilograms (2,204,600 pounds); carbolic acid, crude, 573,950 kilograms (1,265,330 pounds); carbolic acid, refined, 8,396 kilograms (18,510 pounds); creosote and creosote oil, 87,179 kilograms (192,195 pounds); solvent naphtha, 9,981 kilograms (22,004 pounds).

All the other articles enumerated in the circular are grouped in the statistics in such a way that it is impossible for me to separate them.

The Christiania Gas Works, which are the property of the city, produce annually some 400,000 hectoliters (1,134,800 bushels) of coke more than they consume, and gas works in other towns produce a proportionate amount.

The total import of coke, coal, and cinders into Norway in 1897 was 15,374,572 hectoliters (43,617,661 bushels). The three articles are combined in the statistics and are all free of duty.

Germany furnishes the greater portion of the lubricating and other oils, except petroleum, which are imported into Norway. Crude fish oil, dark-colored, is largely exported from Norway to Germany; in 1897, the quantity exported was 50,500 hectoliters (1,333,200 gallons). The Netherlands and Great Britain import annually from Norway some 70,000 hectoliters (1,848,000 gallons) of this crude fish oil. In these countries this oil is treated chemically, and a large portion of it, in the form of oil for lubricating, etc., is again sold to Norway. The German trade in this line was much larger some years ago than it is at present, when native competition must be met, but it is still of considerable importance. In these preparations of crude fish oil, the ingredients of certain by-products of coal tar may probably enter.

The dealers in these products are very reticent, and I am unable to make a full report as to prices. The following gives the wholesale prices now ruling in the Christiania market of articles in regard to which I am able to obtain information:

Coal tar, $3.28 to $3.90 per barrel of 40 gallons, c. i. f.; light and heavy oils, $2.50 to $3 per barrel of 40 gallons, c. i. f.; tar asphalt, $6.60 per ton, + freight; tarred roofing felt—brown, 5½d. per yard; black, 4d. per yard, less 60 per cent, c. i. f. Paving pitch, $14.60 to $16 per ton, c. i. f.; Scotch furnace tar, $2.85 to $3 per barrel, c. i. f.; gaswork tar, free of water, in hardwood barrels, $3.75 per barrel, c. i. f.; coal-tar pitch, $8.50 per ton, c. i. f.; carbolic oil, 49 cents per gallon, + freight; carbolic acid, 98 per cent, $6.55 per 100 kilograms, + freight; creosote, $2.65 per hectoliter (26.4 gallons), + freight; benzine, 5¼ cents per kilogram (2.2046 pounds); cresylic acid, $12.25 per cask of 40 gallons, c. i. f.; lampblack, $2.50 per 100 kilograms (220.46 pounds,

+freight; green oil, about 5.6 cents per kilogram, c. i. f.; red oil, about 7.4 cents per kilogram, c. i. f.

The exports from Norway of any of the articles named in the circular are insignificant. Of coal oil, there was exported in 1897 from the different ports 12,131 hectoliters (320,258 gallons).

The Christiania Gas Works are at present selling coke at the works for 25 cents per hectoliter (2.8 bushels).

HENRY BORDEWICH,
Consul.

CHRISTIANIA, *December 5, 1898.*

SWITZERLAND.

Official statistics show the following exports of coal tar and by-products from Switzerland during the year ending June 30, 1898: Coal-tar colors, $3,228,038; to the United States, $622,129; asphalt, $172,792; to the United States, $5,663. Mineral and tar oils, $1,293; of which the United States received none, according to statistics. Paraffin, benzine, and naphtha, $15,695, of which the United States received $831 worth.

The imports from all countries into Switzerland were as follows: Coal-tar colors, $382,613; asphalt, $40,965; mineral and tar oils, $268,906; paraffin, vaseline, purified benzine, and naphtha, $239,049.

There are no available statistics giving the amount of these articles imported into Switzerland from the United States. The customs authorities are not able to give exact figures, owing to the fact that considerable quantities of coal tar and by-products are exported from the United States to other countries, and from there exported to Switzerland, sometimes as the products of these countries.

I inclose a statement furnished by the consul at Basle, Mr. George Gifford, giving the exports and imports of coal tar and by-products during the year 1897.

JAMES T. DUBOIS,
Consul-General.

ST. GALL, *November 25, 1899.*

Swiss importation and exportation of coal tar and by-products for 1897.

Name of article.	Value of imports, 1897.		Value of exports, 1897.		Average price per metric quintal (220 lbs.).
	Francs.		*Francs.*		*Francs.*
Coal tar	10,391=	$2,005	263,953=	$50,943	3.27=$0.63
Light and heavy oils, being distillates of tar *a*	1,360,027=	262,485	5,047=	974	23.49= 4.53 28.54= 5.51
Tar asphalt *b*	194,016=	37,445	969,056=	187,028	7.25= 1.40 4.11= .79

a Includes anthracene oil and lubricating oils from coal tar.
b Includes tar coke, pitch coke, and petroleum coke.

Swiss importation and exportation of coal tar and by-products for 1897—Continued.

Name of article.	Value of imports, 1897.	Value of exports, 1897.	Average price per metric quintal (220 lbs.).
	Francs.	*Francs.*	*Francs.*
Tarred roofing felt, tarred paper, and asphalt paper	73,837= $14,251	20,935= $4,040	17.12=$3.30 14.17= 2.73
Paving pitch	508,739= 98,187	8,462= 1,633	20.12= 3.88 46.24= 8.92
Coal tar pitch, soft carbolic oil, and carbolic acid, crude and refined *a*	1,708,320= 329,706	56,225= 10,851	40.74= 7.86 40.00= 7.72
Creosote oil, etc			120.00=23.16 77.36=14.93
Solvent naphtha *b*	6,708,988=1,294,835		11.16= 2.15
Aniline and compounds	2,443,800= 471,653	175,431= 33,858	200.00=38.60 199.00=38.40
Lamp black	118,144= 22,802	1,849= 357	48.26= 9.31 58.89=11.37
	13,126,262=2,533,368	1,500,958= 289,685	

a Includes benzole and benzine, 90, 50, and 35 per cent, toluene and toluole, xylene and xylole, naphthalene and anthracene, cresylic acid, and wood preservatives, and wood cement (marine glue).

b Includes naphtha and tar naphtha.

TURKEY.

In compliance with the requirements of Department circular dated October 10, 1898, I submit the following report containing all the information which can readily be obtained:

IMPORTS.

Article.	Quantity.	Price.
Coal tar	Very small	$14 per ton.
Pitch	do	$12 to $13.38 per ton.
Creosote oil	Small; some in capsules	$1.60 to $4.40 per kilogram.
Benzine	7,500 pounds	13 to 21 cents per kilo.
Xylole	Small	27 cents per kilo.
Naphthalene	4,500 pounds	8 to 11 cents per oke.
Cresylic acid	Very small	$13.51 per 100 kilos.
Carbolic acid, crude, 80 per cent	660 pounds	$14.48 per 100 kilos.
Carbolic acid, refined, 100 per cent	440 pounds	54 cents per kilo.

The above figures are approximate per annum. The kilo is equal to 2.2 pounds; the oke equals 2.83 pounds.

The reason why coal tar is not imported is because a large quantity of this article is produced daily by the gas works in this city. This is sold to local dealers and converted into pitch, which is not imported for the same reason. I am informed that the Turkish admiralty also makes pitch from coal tar for the use of the navy, and manufactures some naphthalene and benzine.

Tar coke, pitch coke, and petroleum coke are unknown products here. No statistics can be obtained in regard to the other articles imported.

None of the articles mentioned in the Department's circular are exported from this country, so far as I can ascertain.

CHAS. M. DICKINSON,
Consul-General.

CONSTANTINOPLE, *April 29, 1899.*

AMERICA.

MEXICO.

There is a good demand here for coal tar, and much difficulty in obtaining it. The Waters-Pierce Oil Company, which handles the product of the local gas works, sells the residuum for paving streets, and I learn that the gas company at Vera Cruz has more demand for this residuum than they can fill. For new buildings, I was informed by the Waters-Pierce Oil Company, a good trade might be worked up in tarred roofing felt and in tarred paper. I say for new buildings, for the reason that the old buildings usually have flat roofs made of stone or tiles, but modern methods are becoming known here, and in one portion of this city especially a large number of modern American houses will shortly be built.

I find that of the articles named in the list in the circular, very few have been exported from the United States to this Republic, though some of the articles may be comprised in the general heading used by the Mexican custom-house in regard to articles "not specified." In this event the importation would be naturally very small, as all important articles are given due prominence. I find from the list of importations into this Republic that only the following articles have been imported to the extent named: Coal tar, 1897–98, $4,482 Mexican ($2,053 gold). Tar asphalt, 1897–98, $7,418 Mexican ($3,399 gold); no market value fixed here. Carbolic acid, 1897–98, $3,576 ($1,638); value, $150 ($68.90) per 100 kilos (220.46 pounds) for the crude. Solvent naphtha and green and red oils, also naphtha and tar naphtha, are not shown as imported, but may be included in the importations of crude and refined oil, which amount to $423,581. Benzine sells here at 50 cents (22.9 cents) per kilo, 74 per cent; value imported in 1897–98, $2,657 ($1,217). Anthracene, $146 ($66.86); imported 1897–98; no fixed value. Lampblack sells at $38 per 100 kilos ($17.40 per 220.46 pounds); no importations. Marine glue is worth $40 ($18.32), more or less, according to the wet or dry season, since it is not made in the wet season, on account of the difficulty in hardening; no importations on record. Aniline and lucigen oils sell at $130 ($59.54) per 220 pounds; no importations are recorded.

ANDREW D. BARLOW,
Consul-General.

MEXICO, *November 1, 1898.*

GUATEMALA.

The trade of this Republic in coal tar and its by-products amounts to almost nothing and consists entirely of imports. There are practically no manufactories using the crude material, and there is no probability of the trade being anything but small and unimportant.

During the past year, 700 barrels of lubricating oil of tar were imported, mainly from Germany, although a small portion came from the United States. From the United States there were received 22,000 cases of 5-gallon tins of petroleum, 150 rolls of tar paper for roofs, 900 packages of pitch, 15 to 20 tanks of gasoline, 250 pounds of naphthalene, and 25 pounds of oil of aniline. This was the entire amount imported. From the United States, Germany, England, and France there were also received 100 gallons of crude carbolic acid, 800 pounds of refined or crystallized carbolic acid, 100 pounds of creosote, and 100 gallons of benzine.

The trade in these articles is so small that the customs authorities publish no statistics of the by-products of tar, but condense them under the headings of tar, oils, etc. The total value of tar imported was $638.60; of pitch, $5,063.10, and of petroleum, $40,018.50.

A. M. BEAUPRÉ,
Consul-General.

GUATEMALA, *November 28, 1898.*

SALVADOR.

I beg to acknowledge receipt of circular relating to foreign trade in coal tar and its by-products.

There is very little, if any, coal tar or by-products used in this country. There are no factories here, and the principal import in this line is petroleum, for burning.

J. OLOVVICH,
Acting United States Vice-Consul.

SAN SALVADOR, *November 9, 1898.*

WEST INDIES.

ANTIGUA.

None of the articles specified in the Department circular are exported from or imported into this island, except as below indicated:

Imports, 1897 (from United States): Pitch and tar, $60.24; kerosene, $5,416.24; other oils, not classified, $173.32. First six months of 1898: Pitch and tar, $136.32; kerosene, $2,341.72; other oils, not classified, $142.96.

HENRY M. HUNT, *Consul.*

ANTIGUA, *November 29, 1898.*

BAHAMAS.

The consumption of coal tar and its by-products in this colony is very small indeed, the business and industries of the islands not demanding them in any great quantity. The exact amount of coal tar imported can not be ascertained, since both kinds of tar, as well as pitch, are entered at the custom-house as pitch and tar. Customs statistics show that during 1897, the total quantity of pitch and tar imported was 212 barrels, valued at $426.30. In the opinion of the largest dealer in these articles, the quantity of coal tar imported does not exceed 50 barrels per annum. It is sold here at from $7 to $7.50 per barrel. It is used principally by owners of small sponging and fishing craft, for coating the bottoms of their vessels, as it is destructive to marine life. The pine tar is used for decks and rigging. Pitch is sold at about $6 per barrel. It is estimated that the total value of all the pine tar, coal tar and its by-products, and pitch imported into this colony will not exceed $700 per annum.

I will add that the foregoing articles are entirely the product of and are imported from the United States.

THOMAS J. MCLAIN, *Consul.*

NASSAU, *November 23, 1898.*

GUADELOUPE.

In reply to Department circular, none of the articles enumerated are imported into or exported from this colony, except, perhaps, insignificant quantities of carbolic acid, creosote, benzine, etc., by druggists.

LOUIS H. AYMÉ, *Consul.*

GUADELOUPE, *November 7, 1898.*

MARTINIQUE.

Apart from very limited quantities of coal tar and carbolic acid, none of the by-products of coal tar enumerated in the Department circular are imported into this island. I may add that the small quantities of carbolic acid, crude and refined creosote in its various forms, benzole, and benzine imported come only from France, and are received by the druggists of the island. The tariff almost prohibits the import of these goods from foreign markets.

A. TESTART,
Acting Vice-Consul.

ST. PIERRE, *November 22, 1898.*

ARGENTINE REPUBLIC.

In the first nine months of the year 1898, the imports of coal tar amounted to 204,644 kilos (451,147 pounds), valued at $10,665 gold, showing an increase of 56,046 kilos (451,158 pounds), and a value of $3,091 gold, over the year 1897.

During the same period, the imports of lubricating oil, valvolina, and cylindrina were 3,778 tons, valued at $377,791 gold, being an increase of 1,317 tons, and a value of $131,614 gold, over 1897.

The importation of asphalt in the first nine months of 1898 amounted to 167,500 kilos (369,271 pounds), valued at $6,700 gold, being a decrease of 678,766 kilos (1,496,488 pounds, value $27,870 gold) from the amount imported in the year 1897.

Tarred roofing felt, tarred paper, and asphalt paper are not classified in the statistics.

Statistics in regard to paving pitch give 5,936 tons, valued at $178,086 gold, being an increase of 2,875 tons over the year 1897.

The coke imported amounts to 3,015 tons, of a value of $24,120 gold, a decrease of 3,969 tons (value $31,750 gold) over the year 1897.

The importation of naphtha in the first nine months of 1898 was 3,345 tons, of a value of $334,534 gold, being an increase of 1,419 tons (value $141,889 gold) over the year 1897.

Seventy-one thousand nine hundred and ninety-one kilos (158,711 pounds) of benzole and benzine, of a value of $10,880 gold, were imported in 1898, being an increase of 3,440 kilos (7,584 pounds, value $592 gold) over the year 1897.

Statistics of all kinds of glue imported in 1898 show 160,334 kilos (353,472 pounds), of a value of $31,454 gold, being an increase of 36,292 kilos (80,009 pounds, value $4,560 gold) over the year 1897. Marine glue is not especially specified.

The statistics of imports do not specify wood preservatives and wood cement. Coal tar is used here as a wood preservative.

Creosote oil, anthracene oil, green and red oil, toluene and toluole, xylene and xylole, naphthalene and anthracene, cresylic acid, aniline and lucigen oils, huile siderale, are not classified in statistics, being imported in very small quantities under the classification of "other oils." Lampblack also can not be found in the statistics.

It is impossible to obtain figures covering the imports into and exports from the several countries.

D. MAYER, *Consul.*

BUENOS AYRES, *December 7, 1898.*

ECUADOR.

The custom-house statistics for the year ending December 31, 1897, mention separately only the items coal tar and anilines, in the line named in circular; perhaps some of the other by-products may be included under general headings, but the quantities must be insignificant.

Anilines imported into Ecuador from—	Weight.	Value in Ecuadorian silver.	Equivalent value United States gold.
	Kilos. Pounds.		
Germany	15,637=34,473	$10,909	$5,321.46
Belgium	818= 1,803	550	268.29
France	588= 1,296	554	270.25
England	575= 1,268	480	234.15
United States	3= 6.6	4	1.95
Total	17,621=38,847	12,497	6,096.10

Anilines are retailed by the drug dealers at about $1.10 per pound.

Coal tar is not imported for the market, and therefore I can give no local quotations. Importations for private use during the year ending December 31, 1897, were:

Coal tar imported into Ecuador from—	Weight.	Value in Ecuadorian silver.	Equivalent value United States gold.
	Kilos. Pounds.		
England	9,464=20,864	$1,310	$639.02
Germany	3,369= 7,427	640	312.20
United States	3,276= 7,222	294	143.41
Total	16,109=35,513	2,244	1,094.63

PERRY M. DE LEON,
Consul-General.

GUAYAQUIL, *November 11, 1898.*

PARAGUAY.

Coal tar and its by-products are almost unknown in this market, and statistics must be restricted to a very few of the articles.

The following table covers all the information I have been able to obtain:

Imports in 1897.

	Quantity.	Value.	Duty.	Price.
	Kilos.	*Gold.*	*Per cent.*	
Naphthalene	203	$39	25	35 cents per pound.
Benzine	156	47	25	36 cents per pint.
Tar oil	7,067	353	25	8½ cents per pound.
Do	2,170	263	[a] Free.	
Oil for machines	14,847	1,238	[a] Free.	7 cents per pound.
Canvas (for tar)	22,056	10,081	25	No. 5 cotton 40 cents per yard.
Do	191	142	[a] Free.	

[a] Special concessions in favor of industrial enterprises.

There is no tarred canvas introduced, as the canvas is covered with tar by the purchaser.

Oil (valvolina) used for cylinders is sold at 12 cents per pound.

Lampblack and asphalt tar are not found in the returns of the custom-house.

JOHN N. RUFFIN, *Consul.*

ASUNCION, *January 14, 1899.*

URUGUAY.

The statistical bureau of Uruguay reports that the imports from the United States, of tar, rosin, and pitch, and compounds thereof, for the years named were:

Year.	Kilos.	Value.
1895	2,159,707	$43,215
1896	2,062,034	41,292
1897	....	*a* 2,893

a Apparently incomplete.

The importations from other countries for the years 1895 and 1896 were as follows:

	1895.		1896.	
	Kilos.	Value.	Kilos.	Value.
Germany	71,962	$2,155	58,504	$1,745
Italy	89,670	1,794	35,700	714
Argentina	68,324	1,500	20,913	626
Belgium	27,680	831	1,500	45
England	19,783	591	154,000	3,257
Brazil	29,418	588	10,953	219
Spain	693	14	....	....
Total	307,530	7,473	280,570	6,606

All tars appear under one classification. All the by-products of coal tar are scheduled under the head of "Drugs and chemicals not directly specified." The amount and value of imports are small and are not definitely given. Roofing felt to the value of $627 in 1895 and $304 in 1896 was imported; but its use is not general.

There is no demand for paving pitch, for the reason that all pavements are of granite. Pitch, however, is used to render outer walls damp-proof, and in that way much is consumed, for the walls even when cemented are very porous.

Carbolic acid in all its forms comes from Germany, as well as by-products. The city gas company finds a local market for about all its tar products, in the many uses to which they can be put, as preservatives of wood, coating for walls, and crude disinfectants. There is no distillation of any such products in the Republic. The demand for lubricating oils from coal tar is small.

ALBERT W. SWALM, *Consul.*

MONTEVIDEO, December 12, 1898.

ASIA.

ADEN.

In reply to circular of October 11, 1898, I have to report that none of the articles mentioned therein are imported into this district.

The unusual delay in answering this circular is due to sickness and my inability to see at an earlier date the proper authorities to get information.

E. S. CUNNINGHAM, *Consul.*

ADEN, *January 26, 1899.*

BRITISH INDIA.

There was imported into British India during the year ending March 31, 1898, under the head of "Pitch, tar, and dammar:"

From—	Quantity.	Value.
	Cwt.	
United Kingdon	84,508	$104,084
Austria-Hungary	193	316
Germany	205	783
Cape Colony	11	8
Arabia	12	8
Ceylon	750	885
Straits Settlements	29,429	46,596

This was distributed as follows:

	Quantity.	Value.
	Cwt.	
Bengal	53,053	$79,539
Bombay	25,116	81,097
Sind	5,570	6,992
Madras	16,966	19,278
Burma	14,203	15,829

The government report does not give the quantity and value of the various products separately. I addressed a letter to the collector of customs, Calcutta, requesting him, if he had the statistics in his office, to give me the details. I inclose his reply, which does not cover all the products named in the circular, but indicates the quantity and value of such products imported into Bengal, some of them under different names. I also addressed a letter to Messrs. Ahmuty & Co., the largest dealers in such merchandise in Calcutta, requesting such information as they were able and willing to give as to quantities sold and the prices, and inclose their reply. Messrs. Harton & Co. are also dealers in such articles here, and Messrs. R. Scott Thompson & Co. (Limited), druggists, import creosote oil, naphtha, tar naphtha, benzole, and benzine.

R. F. PATTERSON, *Consul-General.*

CALCUTTA, *December 29, 1898.*

LETTER FROM COLLECTOR OF CUSTOMS.

The Consul-General of the United States of America, *Calcutta.*

Sir: With reference to your letter dated the 17th instant, asking for information regarding certain articles of merchandise imported during the past year, I have the honor to inclose a statement showing the quantities of the articles named imported during the year 1897-98.

I regret that details are not available for the remaining articles enumerated by you.

I have the honor to be, sir, your most obedient servant,

E. V. Levinge,
Officiating Collector of Customs.

Statement showing the quantities of certain articles imported into Calcutta during the official year 1897-98.

Articles.	Quantities.
Tar, coal .... cwts..	32,317
Pitch, coal .... do...	5,192
Lubricating oil .... gallons..	3,207,660
Glue	....
Asphalt .... cwts..	13,884
Coke .... tons..	3,347
Disinfecting and deodorizing fluid and powders	....
Benzole oil .... gallons..	380

LETTER FROM AHMUTY & CO.

The Consul-General of the United States of America,
Calcutta.

Dear Sir: We have to own receipt of your letter, dated the 19th ultimo, covering a circular headed, "Foreign trade in coal tar and its by-products."

We regret our inability to give you the desired information. We can only say that we are regular importers from Great Britain of coal tar, coal-tar pitch, and marine glue. We do not, however, care to give prices, because there is a good deal of variation in them. We are importing American manufactured goods through the New York Export and Import Company, and if the New England people care to quote us for the articles above named, we will consider whether we can give their manufactures a trial.

Yours, faithfully, Sam. C. Chandler.

DUTCH INDIA.

The collector of customs informs me that in the by-products of tar there is so very little business done, that the importations are not even classified at the custom-house, but are lumped under "miscellaneous." I give, however, the importations of coal tar for 1897: From Holland, $18,111; from England, $2,348; from Penang, $3,173; from Singapore, $5,908; from Malacca, $21; total, $29,561. The market price of coal tar here is about $5.50 a barrel.

Imports of Swedish tar: From Holland, $16,742; from England, $476; from Penang, $1,041; from Singapore, $1,899; total, $20,158. The market price of Swedish tar here is about $6.50 a barrel.

There is no duty on tar entering into this colony. None of the articles mentioned in the circular are manufactured or exported from here.

SIDNEY W. EVERETT, *Consul.*

BATAVIA, *January 10, 1899.*

JAPAN.

During the year 1897, imports into Japan of the articles specified were as follows:

	Quantity.	Value.
Tar and pitch from—	*Pounds.*	
China	183, 156	$1, 131. 05
Germany	16, 069	109. 20
Great Britain	109, 385	997. 07
Sweden and Norway	7, 073	109. 75
United States	124, 509	1, 035. 60
Total	440, 192	3, 382. 67
Carbolic acid from—		
Germany	6, 569	908. 88
Great Britain	140, 817	19, 434. 32
Total	147, 386	19, 343, 20
Salicylic acid from—		
Germany	134, 820	53, 337. 06
Great Britain	16, 800	6, 629. 00
Total	151, 620	59, 966. 06
Alizarin dyes from—		
France	1, 261	438. 57
Germany	89, 891	50, 017. 80
Switzerland	2, 290	1, 531. 36
Other countries	1, 088	131. 75
Total	92, 530	52, 119. 48
Aniline dyes from—	*Pounds.*	
Belgium	11, 689	4, 302. 12
France	15, 713	2, 793. 22
Germany	1, 206, 424	401, 319. 47
Great Britain	4, 303	1, 862. 61
Holland	667	264. 60
Italy	3, 467	1, 082. 95
Switzerland	191, 725	52, 877. 73
Other countries	832	96. 00
Total	1, 434, 320	464, 598. 70
Paraffin wax from—		
British India	862, 877	29, 799. 68
Germany	16, 672	718. 45
Great Britain	751, 783	21, 440. 13
United States	3, 800, 015	112, 000. 03
Total	5, 431, 347	163, 958. 24

During the same period, the exports from Japan of tar and its products, all being of foreign origin, were: aniline dyes, 25,256 pounds, value, $8,964.70; tar and pitch, 10,727 pounds, value, $103. Owing to the unwillingness of merchants to divulge details of their business, I am unable to furnish any useful information as to prices. A fair idea of values may be gained from the foregoing statistics, which are based upon the invoices presented at and passed through the Japanese custom-houses.

In conclusion, it is proper to say that after January 1, 1899, the following ad valorem duties will be levied upon imports into Japan: Aniline dyes, 10 per cent; paraffin oil, 10 per cent; paraffin wax, 5 per cent; alizarin dyes, 10 per cent; salicylic acid, 10 per cent; carbolic acid, 10 per cent; pitch, wood tar, and coal tar, 5 per cent; gasoline, 10 per cent; oil and wax, 10 per cent; dyes, colors, and paints, 10 per cent; vaseline, 10 per cent; tarred paper and asphalt paper, 15 per cent; woolen felt, 15 per cent; unenumerated manufactured products, 20 per cent.

JOHN F. GOWEY,
Consul-General.

YOKOHAMA, *November 25, 1898.*

PERSIA.

For several reasons, the manufacture of gas in Persia has hitherto met with very little encouragement, and when the experiment has been tried it has always turned out a failure. The coal generally is as good as could be found for the purpose, and the excavation has few features of serious difficulty. In districts where water is found in proximity to the seams—as no machinery exists of sufficient pumping capacity—workings are either abandoned or never attempted. In some cases where the seams follow a horizontal position, terminating outwardly on the slope of a mountain or hill, the drainage follows the workings, with comparatively little preparation or expense. The roads connecting Teheran with the mines are both bad and difficult, and such as only pack animals can traverse. The means of transport are confined to camels, mules, and donkeys, and this method of carriage has within the last few years risen enormously in cost. Hitherto, lighting houses by gas has, on account of the ignorance and untrustworthiness of servants and others, been considered too dangerous for ordinary use. The ultimate cost of coal, which amounts to upward of $15 a ton, renders the price of gas far too high for domestic use.

About eighteen years ago gas works were erected in Teheran, at the expense of the Government, for lighting certain streets and thoroughfares, but the expense was great, and as the retorts wore out the enterprise was abandoned and petroleum lamps were substituted.

In 1891, a Belgian company obtained an exclusive concession for the manufacture of gas in Teheran, and spent considerable sums of money in putting the old works in repair, refitting them with new machinery and plant, and laying pipes in various streets and squares; but on account of the Government failing in its part of the contract, and the manufacturing machinery getting out of order, gaslighting was again given up and the petroleum lamps were once more restored.

The tar produced during these two periods never underwent any refining process. Indeed, no machinery was imported for that purpose, and it was used chiefly for coating beams and rafters for buildings to protect them from the ravages of white ants, which are extremely destructive in Teheran. As Teheran is the only city or town in Persia where any attempt has been made to introduce gas, none of the products mentioned in the circular have been exported.

In the manufacture of carpets, of an inferior quality, in certain districts aniline dyes are used to some extent, but scarcely any other by-product of tar, except in small quantities, for medicinal and sanitary purposes, is imported into Persia. If these useful articles could be placed on the market in large quantities and at moderate prices, they would, when the utility of them came to be recognized, find ready buyers. The names of most of those mentioned in the circular are virtually unknown, even by those to whom they would be most useful.

From a variety of causes, trade at the present time is much depressed and native dealers can be induced to buy only when there is a fair prospect of their goods finding ready purchasers. They have, however, the salutary virtue of being satisfied with small, when they can not get large, profits.

ARTHUR S. HARDY, *Minister.*

TEHERAN, *December 14, 1898.*

STRAITS SETTLEMENTS.

In reply to Department circular, I append the following statistics covering the imports into and the exports from this district of the following articles, during the year ended December 31, 1897:

	Imports.	Value (round numbers).	Exports.	Value (round numbers).
Coal tar.....casks..	3,288	$16,500	1,641	$8,500
Pitch.....do....	47	110	72	300
Swedish tar.....do....	468	2,800	125	800
Coke.....tons..	624	7,200	562	7,700
Lubricating oil.....	....	49,800	....	500

The prices ruling for the above are as follows: Coal tar, $8.50 to $10.50 per cask; Swedish tar, $11 to $13 per cask; pitch, $4.50 to $5.50 per cask; coke, $24 to $25 per ton.

Of the remainder of the articles mentioned, only refined carbolic oil, carbolic acid, creosote oil, naphtha, and lampblack are found in this market. The quantities imported, however, are so unimportant that they do not figure in the official returns, and particulars regarding them are therefore impossible to obtain.

E. SPENCER PRATT,
Consul-General.

SINGAPORE, *January 31, 1899.*

SYRIA.

I inclose a statement of annual imports into and exports from Beirut; also the price of articles enumerated in Department circular which enter into the trade of this place. As no information could be obtained at the custom-house, I have conferred with the two leading chemists in Beirut, representing Barondi's pharmacy and the Prussian pharmacy, and also with various merchants. While the figures given apply to Beirut alone, a fairly correct idea of the consumption of the articles mentioned, in Syria as a whole, may be obtained by increasing the quantities reported by 15 or 20 per cent. The only article among those under consideration which is exported from Syria is bitumen. The whole product goes from Beirut to the United States, where it is employed in forming pavements, brightening patent leather, etc. The imported articles enter largely into preparations for technical and medical purposes; or, as in the case of tar coke and pitch coke, are used for tarring boats, roofs, ropes, etc., and for anointing camels.

G. BIE RAVNDAL, *Consul.*

BEIRUT, *November 17, 1898.*

Statement of annual imports into and exports from Beirut of coal tar and by-products, together with prices thereof.

Article.	Quantity.	Price.
IMPORTS.	*Pounds.*	
Coal tar	16,500	$82.73 per 100 kilos or 220 pounds.
Tar coke	14,300	$7.30 per 100 kilos.
Pitch coke	11,200	2¾ cents per oke or 2¾ pounds.
Carbolic oil and carbolic acid:		
Crude	8,800	$7.30 per 100 kilos or 220 pounds.
Refined	440	40 cents per 1 kilo or 2.2 pounds.
Creosote oil (pure)	(*a*)	49 cents per 1 kilo.
Benzole and benzine	5,500	15 cents per 1 kilo.
Toluene and toluole	22	24 cents per 1 kilo.
Xylene and xylole	44	20 cents per 1 kilo.
Naphthaline and anthracene	4,400	7 cents per 1 kilo.
Lampblack	1,430	$14.60 per 100 kilos or 220 pounds.
EXPORTS TO THE UNITED STATES.		
Tar asphalt	148,000	10 cents per oke or 2¾ pounds.

a Small quantity.

AUSTRALASIA.

NEW SOUTH WALES.

Consul Bell writes from Sydney, January 7, 1899:

In reply to circular of October 10, 1898, after considerable inquiry, I conclude that the inclosure from a reliable firm is the best reply I am able to make:

SYDNEY, *December 29, 1898.*

GEO. W. BELL,
Consul of the United States, Sydney.

DEAR SIR: Referring to your letter of December 28 and inclosure, which we now return, we beg to inform you that the trade in coal tar and the rougher by-products is limited to the local gas companies, and we are therefore unable to furnish you with the information required. The importation of carbolic acid is about 5,000 gallons per year, the English price for 33 per cent being 6d. (12 cents) per gallon. Coal-tar benzine is not now used, having been supplanted by the American article manufactured from petroleum oil. Coal-tar naphtha is imported at the rate of about 1,000 gallons per year, and costs 1s. 6d. (36 cents) per gallon.

We are, dear sir, yours faithfully,

ELLIOTT BROS., Ltd.

NEW ZEALAND.

There are no imports on record of any of the articles mentioned in the circular, except as follows: Coal-tar pitch, hard and soft, 15 tons, price 8s. ($1.95) per ton, duty paid; benzole and benzine, 90 per cent, 50 per cent, and 35 per cent, 100 cases cost about 2s. 6d. (61 cents) per gallon; lampblack, small importations, cost, 14s. ($3.41) per hundredweight; marine glue, one-half ton, £2 10s. ($12.17) per hundredweight.

The local product of coal tar sells at 2d. (4 cents) per gallon. The price of tarred felt and paper is: 12,000 bolts, 5s. 10d. ($1.42) per bolt; 100 rolls, 18s. ($4.38) per roll. Carbolic oil and acid sell at 3s. 6d. (85 cents) per gallon in 16 ton quantities.

I regret that this report seems so defective, but the fact of the matter is that the trade in these by-products at the present time is exceedingly small, and the information is as complete as it can be under the existing circumstances.

FRANK DILLINGHAM, *Consul.*

AUCKLAND, *January 25, 1899.*

QUEENSLAND.

The imports into and exports from the colony of Queensland are, unfortunately, not classified, either singly or in bulk, and there is no means of tracing any of the articles mentioned. What are imported are no doubt included under the heading, "Oils in bulk," kerosene, linseed, castor, etc., which were imported during 1897 to the value of $513,833. Some of the other products of coal tar are no doubt embraced under the heading of acids, alkali, chemicals, gums, resins, etc., the value of imports of which was $903,260. Some of the products, notably lubricating oils, may also be included under the heading, "Stores, railway materials;" value of imports during 1897, $1,119,685.

I may state that there is no statistical department or bureau in this colony, and articles are so grouped that it is impossible for me to dissect these statistics as they at present stand.

With regard to the following articles I beg to report as follows:

In coal tar, the several gas companies throughout the colony seem to supply all the present demands of consumers. The price in Brisbane is 8 cents per English gallon. I am unable to give the price in other parts of the colony, but doubtless it is within 2 cents more per gallon.

Light and heavy oils, distillates of tar, are not in use, so far as I can ascertain. Tar asphalt is imported in blocks in small quantities. Tar roofing felt, tarred paper, and asphalt paper are used in small quantities. Ruberiod roofing felt has been lately introduced from the United States; also insulating paper, by the Standard Paint Company, of New York.

Paving pitch, tar coke, pitch coke, petroleum coke, and coal-tar pitch are not imported. Carbolic oil is made in the colony. Carbolic acid, crude, is imported from Great Britain; price in England, 1s. 6d. (36 cents) per gallon (English); refined is not imported. Carbolic acid is free of duty. Creosote oil and solvent naphtha, small quantity used. Anthracene oil, green and red oils, and cresylic acid, not used. Naphtha and tar naphtha, both imported largely. Benzole and benzine, small quantities imported. Toluene and toluole and xylene and xylole, no sale. Naphthalene and anthracene, very small sale. Aniline and lucigen oils not imported; very little used. Huile siderale, not known. Lubricating oils from coal tar, all imported from the United States. Lampblack, imported from England; English price, £3 ($14.59) per 112 pounds in compressed packages. Wood preservatives and wood cement, very small quantities used. Marine glue, imported from England; English price, $2.88 to $5.76 per 112 pounds; duty, 25 per cent ad valorem. Aniline dyes, not manufactured in this colony; no crude materials are imported.

Where no prices are mentioned, it is to be understood that I am unable to obtain them. Importers here seem to be very reticent as to the prices they pay for goods.

W. J. WEATHERILL,
Consular Agent.

BRISBANE, *December 1, 1898.*

VICTORIA.

No statistics as to the imports and exports of the colony of Victoria in coal tar and its by-products can be obtained from the customs department, as they are included in the official returns under the more general headings of "oils," "acids," etc.; and no reliable estimate can be procured from other sources. The trade of the colony in these lines is practically in the hands of two or three of the leading firms, who refuse to impart any information on the subject.

Coal tar, tar asphalt, paving pitch, etc., are manufactured here, but only in sufficient quantities to meet local requirements. Of the other articles consumed, the bulk is imported from Germany through London agents, and it is therefore extremely difficult to obtain reliable prices. The business in most of the by-products of coal tar being limited, there are no definite market quotations, each vendor appearing to have a different price. Many articles, such as toluene, toluole, xylene, xylole, cresylic acid, huile siderale, etc., are almost unknown here, or are used in very limited quantities.

The following statement has been furnished me, but for the reasons stated the prices can not be considered absolutely reliable: Coal tar (made locally), 6 cents per gallon; light and heavy oils, varying prices; tar asphalt, locally made but never sold, used by the makers themselves; tarred roofing felt, tarred paper, and asphalt paper, no business of any extent—no quotations; coal-tar pitch, no business; paving pitch, unused; tar coke, pitch coke, and petroleum coke, no business; carbolic oil crude, no business; carbolic oil refined, $1.09 per gallon, 36 cents per pound retail; creosote oil, price not obtainable; solvent naphtha, 97 cents to $1.09 per gallon by drum; anthracene oil, price not obtainable; green and red oils, price not obtainable; benzole and benzine, about 36 cents; toluene, toluole, xylene, etc., price not obtainable; naphthalene and anthracene, 10 cents per pound retail; cresylic acid, aniline, and lucigen oils, huile siderale, prices not obtainable; lubricating oils from coal tar, from 10 cents to 60 cents per gallon; lampblack, $5.10 per hundredweight; wood preservatives and cement, unknown.

I am of the opinion that if the prices were within the reach of the dealers here, a fair business could be done in benzine, naphtha, carbolic acid and oil, creosote oil, naphthalene, lubricating oils, and lampblack. It would therefore be advisable for the New England Gas and Coke Company to correspond with the following firms in this city, sending prices and all information:

Chemical lines: Rocke, Tompsitt & Co., 292 Flinders street; Felton, Grimwade & Co., 342 Flinders lane; Duerdin & Sainsbury, 309 Flinders lane.

Painters' lines and other oils: E. L. Yencken & Co., 304 Flinders street; W. & G. Dean & Co., off 320 Collins street; Brooks, Robinson & Co., 59 Elizabeth street.

TASMANIA.

The consul at Hobart, Mr. Webster, under date of November 28, 1898, informs me that there is no trade in coal tar there. The whole of the product of the local gas companies (three) is used for making asphalt paths and roadways. No by-products of coal tar are manufactured, and, so far as can be ascertained from the customs statistics, the products enumerated are imported only in very minute quantities.

JOHN P. BRAY,
Consul-General.

MELBOURNE, *January 1, 1899.*

AFRICA.

BRITISH SOUTH AFRICA.

Imports of coal tar, pitch, and asphaltum are entered under one head in the custom-house. There was imported into South Africa in 1897 (with the exception of imports via the port of Delagoa Bay, in Portuguese territory), the following value:

From United Kingdom	$23,249.84
From United States	1,731.96
From Germany	14,738.28
From Sweden	340.55
Total	40,260.63

As all roofs are either iron or tile, no roofing felt or tarred paper was imported; and I can not find that other by-products, as detailed in circular, were imported. I am satisfied, however, that in time many of the by-products could be sold if properly introduced. Coal tar was entered at about 20 cents per gallon.

J. G. STOWE,
Consul-General.

CAPE TOWN, *November 1, 1898.*

LOURENÇO MARQUEZ.

Of all the articles mentioned in the circular only one, coal tar, is imported here. This is used in small quantities, and the detailed customs returns for 1897, just published, contain no statistics relating to its importation, although mention is made of the reexportation to Beira of some 1,000 gallons. The principal importers of coal tar here are Messrs. McIntosh, Findlay & Co., and Messrs. Allen, Wack & Co.

I understand that coal tar enters into the manufacture of cyanide of potassium, large quantities of which are used in the gold mines of the Transvaal, though the quantity imported via this port is, according to the customs statistics, very small indeed. Messrs. Wilcken and Ackerman, of this port, represent a number of Transvaal consumers of cyanide of potassium.

W. STANLEY HOLLIS, *Consul.*

LOURENÇO MARQUEZ, *November 25, 1898.*

MOROCCO.

I beg to acknowledge receipt of the Department circular of October 10 regarding coal tar and its by products. The whole amount of coal tar imported into Morocco does not exceed $200 per annum, and, I understand, it comes from Sweden. It is used in a medicinal way by the Moors for their camels.

S. R. GUMMERE, *Consul-General.*

TANGIER, *November 25, 1898.*

ZANZIBAR.

Referring to circular letter of the Department of October 10, 1898, calling for a report on importation of coal tar and its by-products, I beg to report that the importation into Zanzibar of the articles named is practically nil.

A. L. SARLE,
Acting United States Consul.

ZANZIBAR, *December 21, 1898.*

INDEX.

SEWAGE AND GARBAGE IN FOREIGN COUNTRIES.

Page.
Africa 208
Aix la Chapelle 44
Allen, Horace N. (consul-general, Seoul) 216
America, North 171
America, South 201
Amsterdam 85
Anderson, W. K. (consul, Hanover) 68
Antwerp 20
Argentine Republic 201
Ashby, Newton B. (consul, Dublin) 115
Asia 211
Atwell, W. P. (commercial agent, Roubaix) 42
Australasia 220
Austria-Hungary 17
Aymé, Louis H. (consul, Guadeloupe) 200
Barcelona 92
Barker, Walter B. (consul, Sagua la Grande) 198
Barmen 45
Barthman, R. M. (consul, Malaga) 94
Beaupré, A. M. (consul-general, Guatemala) 197
Bedell, Ossian (consul, Fort Erie) 180
Belgium 20
Bergh, Robert S. S. (consul, Gothenburg) 96
Berlin 47
Billheimer, John C. (consul, Zanzibar) 210
Blom, Jules (vice and deputy consul, Copenhagen) 34
Bolton 157
Bordewich, Henry (consul, Christiania) 98
Bouchsein, Max (consul, Barmen) 47
Bowen, Herbert W. (consul-general, Barcelona) 92
Boyle, James (consul, Liverpool) 128
Bradford 107
Brazil 202
Bristol 112
British Columbia 171
British Honduras 196
British India 211
Browne, Thomas N. (vice and deputy consul, Lyons) 37
  Supplementary report 37
Brühl, Louis H. (consul, Catania) 80
Brundage, Frank M. (consul, Aix La Chapelle) 45
Brunot, Hilary S. (consul, St. Etienne) 43
Brussels 27
Burke, M. J. (consul, Port Stanley and St. Thomas) 190
Burnley 161
Cadiz 93
Campbell, John P. (consul, Port Louis) 210
Canada, Dominion of 171
Carroll, John Howell (consul, Cadiz) 93
Cartagena 203
Carter, Martin J. (consul, St. Johns) 194

Page.
Catania 78
Ceylon 211
Chefoo 212
Chile 202
China 212
Christiania 96
Ciudad Juarez 195
Cole, Charles L. (consul-general, Dresden) 64
Colombia 203
Colon 204
Copenhagen 33
Corey, George J. (consul, Amsterdam) 87
Cork 113
Corunna 93
Cramer, Edward C. (consul, Florence) 82
Crefeld 53
Cuba 198
Daly, Charles N. (consul, Guelph) 180
Darwin 160
Day, Erastus S. (consul, Bradford) 112
De Leon, Perry M. (consul-general, Guayaquil) 205
Denison, Frank C. (consul, Woodstock) 193
Denmark 33
Dickson, Almar F. (consul, Gaspé Basin) 195
Dijon 37
Dillingham, Frank (consul, Auckland) 221
Doyle, Thomas S. (consul, Beirut) 220
Dresden 54
Dublin 113
Dubois, James T. (consul-general, St. Gall) 104
Dundee 115
Dunfermline 115
Dutch India 214
Dutch West Indies 199
Ecuador 205
Erdman, C. W. (consul, Fürth) 67
Everett, Sidney B. (consul, Batavia) 215
Falmouth 115
Florence 80
Ford, Radcliffe H. (consul, Yarmouth) 195
Fowler, John (consul, Chefoo) 212
Fox, Howard (consul, Falmouth) 116
France 34
Frankfort-on-the-Main 65
French West Indies 199
Fürth 66
Gaspé Basin 195
Geneva 98
Germany 44
Ghent 29
Gibraltar 75
Glasgow 116
Goldschmidt, Julius (consul-general, Berlin) 52
Gothenburg 94
Gowey, John F. (consul-general, Yokohama) 215
Greene, C. C. (vice-consul, Antofagasta) 203
Grout, John H., jr. (consul, Malta) 85
Grimké, Archibald H. (consul, Santo Domingo) 201
Guatemala 197
Gudger, H. A. (consul-general, Panama) 205
Guelph 180
Haiti 200
Hamilton 180
Hanover 67
Harmony, Julio (consul, Corunna) 93
Henry, William W. (consul, Quebec) 195
Higgins, John C. (consul, Dundee) 115
Hiogo 215

Page.
Holloway, W. R. (consul-general, St. Petersburg) 92
Honduras 197
Hossfeld, Frederick W. (consul, Trieste) 19
Hunt, Loton S. (consul, Palmerston) 189
Hyatt, Pulaski F. (consul, Santiago de Cuba) 199
Italy 78
Japan 215
Jenkins, John (consul, San Salvador) 198
Johnson, H. A. (consul, Venice) 82
Johnson, James (consul, Sheffield) 170
Jones, A. B. (consul, Tuxpan) 196
Jones, T. C. (consul, Funchal) 208
Kindrick, Charles W. (consul, Ciudad Juarez) 196
Korea 216
Lathrop, Lorin A. (consul, Bristol) 113
Leghorn 82
Leicester 166
Lieberknecht, A. (consul, Zurich) 107
Lincoln, G. F. (consul, Antwerp) 26
Listoe, S. (consul, Rotterdam) 92
Liverpool 125
London (Canada) 186
London (England) 128
Lyon, Samuel S. (consul, Hiogo) 215
Lyons 34
Madeira 208
Madrigal, Rafael (consul, Cartagena) 204
Mahin, Frank W. (consul, Reichenberg) 18
Mainz 68
Malaga 94
Malta 83
Manchester 151
Marseilles 38
Mason, Frank H. (consul-general, Frankfort) 66
Mauritius 209
Mayer, D. (consul, Buenos Ayres) 202
McCunn, J. N. (consul, Dunfermline) 115
Metcalf, Horace W. (consul, Newcastle-upon-Tyne) 164
Mexico 195
Moore, Thomas Ewing (commercial agent, Weimar) 75
Morey, W. (consul, Colombo) 212
Morlan, Albert E. (consul, Belize) 197
Morocco 210
Morris, Henry C. (consul, Ghent) 33
Munich 69
Murphy, George H. (vice-consul, Colon) 205
Myers, Ira B. (consul, St. John) 193
Nanaimo 179
Netherlands 85
New Brunswick 192
Newcastle-upon-Tyne 163
Newfoundland 193
New South Wales 220
New Zealand 221
Nice 39
Nottingham 164
Nova Scotia 194
Nuremberg 69
Nusbaum, Benjamin (consul, Munich) 69
Oldham 154
Ontario 180
Osborne, William M. (consul-general, London) 129
Ozmun, Edward H. (consul, Stuttgart) 75
Palmerston 189
Panama 205
Paraguay 206
Partridge, Frank C. (consul-general, Tangier) 210
Patterson, R. F. (consul-general, Calcutta) 211

Page
Pekin 213
Persia 216
Phelps, Julian (consul, Crefeld) 54
Plumacher, E. H. (consul, Maracaibo) 208
Plymouth 168
Pooley, Robert P. (consul, St. Helena) 210
Port Stanley and St. Thomas 190
Quebec 195
Ragsdale, James W. (consul, Tientsin) 213
Reichenberg 17
Ridgely, Benjamin H. (consul, Geneva) 101
Roosevelt, George W. (consul, Brussels) 29
Rotterdam 87
Roubaix 41
Ruffin, John N. (consul, Asuncion) 206
Russia 92
Sagua La Grande 198
Salvador 197
Santiago de Cuba 198
Santo Domingo (Dominican Republic) 200
Schumann, Walter (consul, Mainz) 69
Seeger, Eugene (consul-general, Rio de Janeiro) 202
Sheffield 169
Shepherd, James M. (consul, Hamilton) 186
Skinner, Robert P. (consul, Marseilles) 39
Smith, Abraham E. (consul, Victoria) 180
Smith, James A. (consul, Leghorn) 82
Smith, L. B. (consul, Curaçao 199
South America 201
Spain 92
Sprague, Horatio J. (consul, Gibraltar) 78
St. Etienne 42
St. Gall 101
St. Helena 210
St. Helens 127
St. John 192
St. Johns 193
St. Peterburg 92
St. Thomas and Port Stanley 190
Stephens, Joseph G. (consul, Plymouth) 169
Stockport 159
Straits Settlements 217
Stuttgart 73
Swalm, Albert W. (consul, Montevideo) 207
Sweden and Norway 94
Swiney, Daniel (consul, Queenstown) 113
Switzerland 98
Syria 218
Taylor, Samuel M. (consul, Glasgow) 125
Terres, John B. (vice-consul-general, Port au Prince) 200
Toronto 191
Trieste 18
Tuxpan 196
Tyler, John (vice-consul-general in charge, Teheran) 217
United Kingdom 107
Uruguay 206
Van Buren, Harold S. (consul, Nice) 41
Vancouver 191
Venezuela 207
Venice 82
Victoria 177
Weber, Gustave C. E. (consul, Nuremberg) 72
Weimar 75
Wellington 179
West Indes 198
Woodstock 193
Woodville, R. (vice-consul, Utilla) 197
Yarmouth 194

Page.
Yokohama 215
Zanzibar 210
Zurich 104

FOREIGN TRADE IN COAL TAR AND BY-PRODUCTS.

Aden 249
Africa 258
America 243
Antigua 244
Argentine Republic 246
Asia 249
Australasia 254
Austria-Hungary 223
Aymé, Louis H. (consul, Guadeloupe) 245
Bahamas 245
Barlow, Andrew D. (consul-general, Mexico) 243
Beaupré, A. M. (consul-general, Guatemala) 244
Belgium 230
Bell, G. W. (consul-general, Sydney) 254
Blom, Jules (vice and deputy consul, Copenhagen) 234
Bordewich, Henry (consul, Christiania) 241
British India 249
British South Africa 258
Bray, John P. (consul-general, Melbourne) 257
Corey, George J. (consul, Amsterdam) 238
Cunningham, E. S. (consul, Aden) 249
De Castro, Hector (consul-general, Rome) 237
De Leon, Perry M. (consul-general, Guayaquil) 247
Denmark 233
Dickinson, Chas. M. (consul-general, Constantinople) 242
Dillingham, Frank (consul, Aukland) 255
Du Bois, James T. (consul-general, St. Galls) 241
Dutch India 250
Ecuador 247
Europe 223
Everett, Sidney B. (consul, Batavia) 251
France 234
Gowey, John F. (consul-general, Yokohama) 251
Gowdy, John K. (consul-general, Paris) 235
Great Britain 236
Greece 236
Grout, John H., jr. (consul, Malta) 237
Guadeloupe 245
Guatemala 243
Gummere, S. R. (consul-general, Tangier) 258
Hardy, Arthur S. (minister, Teheran) 253
Hollis, W. Stanley (consul, Lourenço Marquez) 258
Holloway, W. R. (consul-general, St. Petersburg) 239
Hunt, Henry W. (consul, Antigua) 244
Hurst, Carl Bailey (consul-general, Vienna) 230
Italy 237
Japan 251
Lincoln, George F. (consul-general, Antwerp) 233
Lourenço Marquez 258
Malta 237
Martinique 245
Mayer, D. (consul, Buenos Ayres) 246
McGinley, Daniel E. (consul, Athens) 236
McLain, Thomas J. (consul, Nassau) 245
Mexico 243
Morocco 258
Netherlands 237
New South Wales 254
New Zealand 255
Norway 240
Olovvich, J. (acting vice-consul, San Salvador) 244
Osborne, William M. (consul-general, London) 236

	Page.
Patterson, R. F. (consul-general, Calcutta)	249
Paraguay	247
Persia	252
Pratt, E. Spencer (consul-general, Singapore)	253
Queensland	255
Ravndal, G. Bie (consul, Beirut)	254
Ruffin, John N. (consul, Asuncion)	248
Russia	239
Salvador	244
Sarle, A. L. (acting consul, Zanzibar)	259
Stowe, J. G. (consul-general, Cape Town)	258
Straits Settlements	253
Swalm, Albert W. (consul, Montevideo)	248
Sweden	239
Switzerland	241
Syria	253
Tasmania	257
Testart, A. (acting vice-consul, St. Pierre)	245
Turkey	242
Uruguay	248
Victoria	256
Weatherill, W. J. (consular agent, Brisbane)	256
West Indies	244
Winslow, Edward D. (consulg-eneral, Stockholm)	239
Zanzibar	259

○

56TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 257.

SPECIAL CONSULAR REPORTS.

MERCHANT MARINE

OF

FOREIGN COUNTRIES.

VOL. XVIII.

REPORTS FROM CONSULS OF THE UNITED STATES, IN ANSWER TO
INSTRUCTIONS FROM THE DEPARTMENT OF STATE.

Issued from the Bureau of Foreign Commerce,
Department of State.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1900.

CONTENTS.

Page.

List of Publications v

Austria 3

Belgium 10

Denmark 13

France 16

Germany 52

Italy 68

Netherlands 76

United Kingdom 107

Dominion of Canada 137

Mexico 151

Costa Rica 151

Guatemala 152

Salvador 152

Antigua 152

Haiti 153

Martinique 153

Dutch West Indies 154

Chile 155

Ecuador 158

The Guianas 158

Paraguay 158

Uruguay 159

Cape Colony 162

Zanzibar 162

British India 162

Dutch India 163

Hongkong 165

Straits Settlements 166

Japan 167

Australia 172

New Zealand 175

PUBLICATIONS OF THE BUREAU OF FOREIGN COMMERCE.*

The publications of the Bureau of Foreign Commerce, Department of State, are:

I.—COMMERCIAL RELATIONS, being the annual reports of consular officers on the commerce, industries, navigation, etc., of their districts.

II.—CONSULAR REPORTS, issued monthly, and containing miscellaneous reports from diplomatic and consular officers.

III.—ADVANCE SHEETS, CONSULAR REPORTS, issued daily, except Sundays and legal holidays, for the convenience of the newspaper press, commercial and manufacturing organizations, etc.

IV.—EXPORTS DECLARED FOR THE UNITED STATES, issued quarterly, and containing the declared values of exports from the various consular districts to the United States for the preceding three months.

V.—SPECIAL CONSULAR REPORTS, containing series of reports from consular officers on particular subjects, made in pursuance to instructions from the Department.

Following are the special publications issued by the Bureau prior to 1890:

Labor in Europe, 1878, one volume; Labor in Foreign Countries, 1884, three volumes; Commerce of the World and the Share of the United States Therein, 1879; Commerce of the World and the Share of the United States Therein, 1880–81; Declared Exports for the United States, First and Second Quarters, 1883; Declared Exports for the United States, Third and Fourth Quarters, 1883; Cholera in Europe in 1884, 1885; Trade Guilds of Europe, 1885; The Licorice Plant, 1885; Forestry in Europe, 1887; Emigration and Immigration, 1885–86 (a portion of this work was published as CONSULAR REPORTS No. 76, for the month of April, 1887); Rice Pounding in Europe, 1887; Sugar of Milk, 1887; Wool Scouring in Belgium, 1887; Cattle and Dairy Farming in Foreign Countries, 1888 (issued first in one volume, afterwards in two volumes); Technical Education in Europe, 1888; Tariffs of Central America and the British West Indies, 1890.

The editions of all these publications except Tariffs in Central America, etc., are exhausted and the Department is, therefore, unable to supply copies.

In 1890, the Department decided to publish reports on special subjects in separate form, to be entitled SPECIAL CONSULAR REPORTS. There are now the following SPECIAL CONSULAR REPORTS:

Vol. 1 (1890).—Cotton Textiles in Foreign Countries, Files in Spanish America, Carpet Manufacture in Foreign Countries, Malt and Beer in Spanish America, and Fruit Culture in Foreign Countries.

Vol. 2 (1890 and 1891).—Refrigerators and Food Preservation in Foreign Countries, European Emigration, Olive Culture in the Alpes Maritimes, and Beet-Sugar Industry and Flax Cultivation in Foreign Countries.

Vol. 3 (1891).—Streets and Highways in Foreign Countries. (New edition, 1897.)

Vol. 4 (1891).—Port Regulations in Foreign Countries.

Vol. 5 (1891).—Canals and Irrigation in Foreign Countries. (New edition, 1898.)

Vol. 6 (1891 and 1892).—Coal and Coal Consumption in Spanish America, Gas in Foreign Countries, and India Rubber.

Vol. 7 (1892).—The Stave Trade in Foreign Countries and Tariffs of Foreign Countries.

Vol. 8 (1892).—Fire and Building Regulations in Foreign Countries.

Vol. 9 (1892 and 1893).—Australian Sheep and Wool and Vagrancy and Public Charities in Foreign Countries.

---

* Formerly Bureau of Statistics. Name changed to Bureau of Foreign Commerce by order of the Secretary of State, July 1, 1897.

Vol. 10 (1894).—Lead and Zinc Mining in Foreign Countries and Extension of Markets for American Flour. (New edition, 1897.)

Vol. 11 (1894).—American Lumber in Foreign Markets. (New edition, 1897.)

Vol. 12 (1895).—Highways of Commerce. (New edition, 1899.)

Vol. 13 (1896 and 1897).—Money and Prices in Foreign Countries.

Vol. 14 (1898).—The Drug Trade in Foreign Countries.

Vol. 15 (1898).—Part I. Soap Trade in Foreign Countries; Screws, Nuts, and Bolts in Foreign Countries; Argols in Europe, Rabbits and Rabbit Furs in Europe, and Cultivation of Ramie in Foreign Countries. Part II. Sericulture and Silk Reeling and Cultivation of the English Walnut.

Vol. 16 (1899).—Tariffs of Foreign Countries. Part I. Europe. Part II. America. Part III. Asia. Part IV. Africa. Part V. Australasia and Polynesia. (Parts III, IV, and V not yet published.)

Vol. 17 (1899).—Disposal of Sewage and Garbage in Foreign Countries; Foreign Trade in Coal Tar and By-Products.

Vol. 18 (1900).—Merchant Marine of Foreign Countries.

Of these SPECIAL CONSULAR REPORTS, Australian Sheep and Wool, Cotton Textiles in Foreign Countries, Files in Spanish America, Fire and Building Regulations, Gas in Foreign Countries, Lead and Zinc Mining, Malt and Beer in Spanish America, Port Regulations, Refrigerators and Food Preservation, Vagrancy, etc., are exhausted, and no copies can be supplied by the Department.

Of the monthly CONSULAR REPORTS, many numbers are exhausted or so reduced that the Department is unable to accede to requests for copies. Of the publications of the Bureau available for distribution, copies are mailed to applicants without charge. In view of the scarcity of certain numbers, the Bureau will be grateful for the return of any copies of the monthly or special reports which recipients do not care to retain. Upon notification of willingness to return such copies, the Department will forward franking labels to be used in lieu of postage in the United States, Canada, the Hawaiian Islands, and Mexico.

Persons receiving CONSULAR REPORTS regularly, who change their addresses, should give the old as well as the new address in notifying the Bureau of the fact.

In order to prevent confusion with other Department bureaus, all communications relating to consular reports should be carefully addressed, "Chief, Bureau of Foreign Commerce, Department of State, Washington, U. S. A."

VALUES OF FOREIGN COINS AND CURRENCIES.

The following statements show the valuation of foreign coins, as given by the Director of the United States Mint and published by the Secretary of the Treasury, in compliance with the first section of the act of March 3, 1873, viz: "That the value of foreign coins, as expressed in the money of account of the United States, shall be that of the pure metal of such coin of standard value," and that "the value of the standard coins in circulation of the various nations of the world shall be estimated annually by the Director of the Mint, and be proclaimed on the 1st day of January by the Secretary of the Treasury."

In compliance with the foregoing provisions of law, annual statements were issued by the Treasury Department, beginning with that issued on January 1, 1874, and ending with that issued on January 1, 1890. Since that date, in compliance with the act of October 1, 1890, these valuation statements have been issued quarterly, beginning with the statement issued on January 1, 1891.

The fact that the market exchange value of foreign coins differs in many instances from that given by the United States Treasury has been repeatedly called to the attention of the Bureau of Foreign Commerce. An explanation of the basis of the quarterly valuations was asked from the United States Director of the Mint, and under date of February 7, 1898, Mr. R. E. Preston makes the following statement:

"When a country has the single gold standard, the value of its standard coins is estimated to be that of the number of grains fine of gold in them, 480 grains being reckoned equivalent to $20.67 in United States gold, and a smaller number of grains in proportion. When a country has the double standard, but keeps its full legal-tender silver coins at par with gold, the coins of both gold and silver are calculated on the basis of the gold value.

"The value of the standard coins of countries with the single silver standard is calculated to be that of the average market value of the pure metal they contained during the three months preceding the date of the proclamation of their value in United States gold by the Secretary of the Treasury. The value of the gold coins of silver-standard countries is calculated at that of the pure gold they contain, just as if they had the single gold standard.

"These valuations are used in estimating the values of all foreign merchandise exported to the United States. The value of the Indian rupee, although calculated according to law at the value of the pure metal contained therein, has a commercial value above the value of the silver bullion; consequently the value for customs purposes is determined in each case by the consular certificates attached to the invoice of exports from that country to the United States."

The following statements, running from January 1, 1874, to October 1, 1899, have been prepared to assist in computing the values in American money of the trade, prices, values, wages, etc., of and in foreign countries, as given in consular and other reports. The series of years are given so that computations may be made for each year in the proper money values of such year. In hurried computations, the reductions of foreign currencies into American currency, no matter for how many years, are too often made on the bases of latest valuations. When it is taken into account that the ruble of Russia, for instance, fluctuated from 77.17 cents in 1874 to 37.4 cents in April, 1897, such computations are wholly misleading. All computations of values, trade, wages, prices, etc., of and in the "fluctuating-currency countries" should be made in the values of their currencies in each year up to and including 1890, and in the quarterly valuations thereafter.

To meet typographical requirements, the quotations for the years 1876, 1877, 1879, 1881, 1882, and 1891–95 are omitted, these years being selected as showing the least fluctuations when compared with years immediately preceding and following.

To save unnecessary repetition, the estimates of valuations are divided into three classes, viz: (A) countries with fixed currencies, (B) countries with fluctuating currencies, and (C) quarterly valuations of fluctuating currencies.

A.—*Countries with fixed currencies.*

The following official (United States Treasury) valuations of foreign coins do not include "rates of exchange."

Countries.	Standard.	Monetary unit.	Value in U.S. gold.	Coins.
Argentine Republic*.	Gold and silver	Peso	$0.96,5	Gold—Argentine ($4.82,4) and ½ Argentine; silver—peso and divisions.
Austria-Hungary†	Gold	Crown	.20,3	Gold—20 crowns ($4.05,2) and 10 crowns.
Belgium	Gold and silver	Franc	.19,3	Gold—10 and 20 franc pieces; silver—5 francs.
Brazil	Gold	Milreis	.54,6	Gold—5, 10, and 20 milreis; silver—½, 1, and 2 milreis.
British North America (except Newfoundland).	do	Dollar	1.00	
British Honduras	do	do	1.00	
Chile	do	Peso	.36,5	Gold—escudo ($1.25), doubloon ($3.65), and condor ($7.30); silver—peso and divisions.
Costa Rica	do	Colon	.46,5	Gold—2, 5, 10, and 20 colons; silver—5, 10, 25, and 50 centisimos.
Cuba	Gold and silver	do	.92,6	Gold—doubloon ($5.01,7); silver—peso (60 cents).
Denmark	Gold	Crown	.26,8	Gold—10 and 20 crowns.
Egypt	do	Pound (100 piasters).	4.94,3	Gold—10, 20, 50, and 100 piasters; silver—1, 2, 10, and 20 piasters.
Finland	do	Mark	.19,3	Gold—10 and 20 marks ($1.93 and $3.85,9).
France	Gold and silver	Franc	.19,3	Gold—5, 10, 20, 50, and 100 francs; silver—5 francs.
Germany	Gold	Mark	.23,8	Gold—5, 10, and 20 marks.
Great Britain	do	Pound sterling	4.86,6½	Gold—sovereign (pound sterling) and half sovereign.
Greece	Gold and silver	Drachma	.19,3	Gold—5, 10, 20, 50, and 100 drachmas; silver—5 drachmas.
Haiti	do	Gourde	.96,5	Silver—gourde.
Italy	do	Lira	.19,3	Gold—5, 10, 20, 50, and 100 lire; silver—5 lire.
Japan‡	Gold	Yen	.49,8	Gold—1, 2, 5, 10, and 20 yen.
Liberia	do	Dollar	1.00	
Netherlands§	Gold and silver	Florin	.40,2	Gold—10 florins; silver—½, 1, and 2½ florins.
Newfoundland	Gold	Dollar	1.01,4	Gold—$2 ($2.02,7).
Portugal	do	Milreis	1.08	Gold—1, 2, 5, and 10 milreis.
Russia‖	do	Ruble	.51,5	Gold—imperial ($7.718) and ½ imperial ($3.80); silver—¼, ½, and 1 ruble.
Spain	Gold and silver	Peseta	.19,3	Gold—25 pesetas; silver—5 pesetas.
Sweden and Norway.	Gold	Crown	.26,8	Gold—10 and 20 crowns.
Switzerland	Gold and silver	Franc	.19,3	Gold—5, 10, 20, 50, and 100 francs; silver—5 francs.
Turkey	Gold	Piaster	.04,4	Gold—25, 50, 100, 200, and 500 piasters.
Uruguay	Gold	Peso	1.03,4	Gold—peso: silver—peso and divisions.
Venezuela	Gold and silver	Bolivar	.19,3	Gold—5, 10, 20, 50, and 100 bolivars; silver—5 bolivars.

---

* In 1874 and 1875, the gold standard prevailed.

† The gold standard was adopted October 1, 1892. (See CONSULAR REPORTS No. 147, p. 623.) Values are still, however, frequently expressed in the florin or gulden, which is worth 2 crowns or 40.6 cents.

‡ Gold standard adopted October 1, 1897. (See CONSULAR REPORTS No. 201, p. 259.)

§ See note to table of fluctuating currencies.

‖ For an account of the adoption of the gold standard, see Review of the World's Commerce, 1896–97, p. 254.

FOREIGN WEIGHTS AND MEASURES.

The following table embraces only such weights and measures as are given from time to time in CONSULAR REPORTS and in Commercial Relations:

Foreign weights and measures, with American equivalents.

Denominations.	Where used.	American equivalents.
Almude	Portugal	4.422 gallons.
Ardeb	Egypt	7.6907 bushels.
Are	Metric	0.02471 acre.
Arobe	Paraguay	25 pounds.
Arratel or libra	Portugal	1.011 pounds.
Arroba (dry)	Argentine Republic	25.3175 pounds.
Do	Brazil	32.38 pounds.
Do	Cuba	25.3664 pounds.
Do	Portugal	32.38 pounds.
Do	Spain	25.36 pounds.
Do	Venezuela	25.4024 pounds.
Arroba (liquid)	Cuba, Spain, and Venezuela	4.263 gallons.
Arshine	Russia	28 inches.
Arshine (square)	do	5.44 square feet.
Artel	Morocco	1.12 pounds.
Baril	Argentine Republic and Mexico	20.0787 gallons.
Barrel	Malta (customs)	11.4 gallons.
Do	Spain (raisins)	100 pounds.
Berkovets	Russia	361.12 pounds.
Bongkal	India	832 grains.
Bouw	Sumatra	7,096.5 square meters.
Bu	Japan	0.1 inch.
Butt (wine)	Spain	140 gallons.
Caffiso	Malta	5.4 gallons.
Candy	India (Bombay)	529 pounds.
Do	India (Madras)	500 pounds.
Cantar	Morocco	113 pounds.
Do	Syria (Damascus)	575 pounds.
Do	Turkey	124.7036 pounds.
Cantaro (cantar)	Malta	175 pounds.
Carga	Mexico and Salvador	300 pounds.
Catty	China	1.333⅓ (1⅓) pounds.
Do*	Japan	1.31 pounds.
Do	Java, Siam, and Malacca	1.35 pounds.
Do	Sumatra	2.12 pounds.
Centaro	Central America	4.2631 gallons.
Centner	Bremen and Brunswick	117.5 pounds.
Do	Darmstadt	110.24 pounds.
Do	Denmark and Norway	110.11 pounds.
Do	Nuremberg	112.43 pounds.
Do	Prussia	113.44 pounds.
Do	Sweden	93.7 pounds.
Do	Vienna	123.5 pounds.
Do	Zollverein	110.24 pounds.
Do	Double or metric	220.46 pounds.
Chih	China	14 inches.

*More frequently called "kin." Among merchants in the treaty ports it equals 1.33⅓ pounds avoirdupois.

Foreign weights and measures, with American equivalents—Continued.

Denominations.	Where used.	American equivalents.
Coyan	Sarawak	3,098 pounds.
Do.	Siam (Koyan)	2,667 pounds.
Cuadra	Argentine Republic	4.2 acres.
Do.	Paraguay	78.9 yards.
Do.	Paraguay (square)	8.077 square feet.
Do.	Uruguay	Nearly 2 acres.
Cubic meter	Metric	35.3 cubic feet.
Cwt. (hundredweight)	British	112 pounds.
Dessiatine	Russia	2.6997 acres.
Do.	Spain	1.599 bushels.
Drachme	Greece	Half ounce.
Egyptian weights and measures	(*See* CONSULAR REPORTS No. 144.)	
Fanega (dry)	Central America	1.5745 bushels.
Do.	Chile	2.575 bushels.
Do.	Cuba	1.599 bushels.
Do.	Mexico	1.54728 bushels.
Do.	Morocco	Strike fanega, 70 lbs.; full fanega, 118 lbs.
Do.	Uruguay (double)	7.776 bushels.
Do.	Uruguay (single)	3.888 bushels.
Do.	Venezuela	1.599 bushels.
Fanega (liquid)	Spain	16 gallons.
Feddan	Egypt	1.03 acres.
Frail (raisins)	Spain	50 pounds.
Frasco	Argentine Republic	2.5096 quarts.
Do.	Mexico	2.5 quarts.
Fuder	Luxemburg	264.17 gallons.
Garnice	Russian Poland	0.88 gallon.
Gram	Metric	15.432 grains.
Hectare	do.	2.471 acres.
Hectoliter:		
Dry	do.	2.838 bushels.
Liquid	do.	26.417 gallons.
Joch	Austria-Hungary	1.422 acres.
Ken	Japan	6 feet.
Kilogram (kilo)	Metric	2.2046 pounds.
Kilometer	do.	0.621376 mile.
Klafter	Russia	216 cubic feet.
Koku	Japan	4.9629 bushels.
Korree	Russia	3.5 bushels.
Kwan	Japan	8.28 pounds.
Last	Belgium and Holland	85.134 bushels.
Do.	England (dry malt)	82.52 bushels.
Do.	Germany	2 metric tons (4,480 pounds).
Do.	Prussia	112.29 bushels.
Do.	Russian Poland	11⅓ bushels.
Do.	Spain (salt)	4,760 pounds.
League (land)	Paraguay	4,633 acres.
Li	China	2,115 feet.
Libra (pound)	Castilian	7,100 grains (troy).
Do.	Argentine Republic	1.0127 pounds.
Do.	Central America	1.043 pounds.
Do.	Chile	1.014 pounds.
Do.	Cuba	1.0161 pounds.
Do.	Mexico	1.01465 pounds.
Do.	Peru	1.0143 pounds.
Do.	Portugal	1.011 pounds.
Do.	Uruguay	1.0143 pounds.
Do.	Venezuela	1.0161 pounds.
Liter	Metric	1.0567 quarts.
Livre (pound)	Greece	1.1 pounds.
Do.	Guiana	1.0791 pounds.

Foreign weights and measures, with American equivalents—Continued.

Denominations.	Where used.	American equivalents.
Load	England (timber)	Square, 50 cubic feet; unhewn, 40 cubic feet; inch planks, 600 superficial feet.
Manzana	Costa Rica	1⅜ acres.
Do	Nicaragua and Salvador	1.727 acres.
Marc	Bolivia	0.507 pound.
Maund	India	$82\frac{2}{7}$ pounds.
Meter	Metric	39.37 inches.
Mil	Denmark	4.68 miles.
Do	Denmark (geographical)	4.61 miles.
Milla	Nicaragua and Honduras	1.1493 miles.
Morgen	Prussia	0.63 acre.
Oke	Egypt	2.7225 pounds.
Do	Greece	2.84 pounds.
Do	Hungary	3.0817 pounds.
Do	Turkey	2.85418 pounds.
Do	Hungary and Wallachia	2.5 pints.
Pic	Egypt	21¼ inches.
Picul	Borneo and Celebes	135.64 pounds.
Do	China, Japan, and Sumatra	133⅓ pounds.
Do	Java	135.1 pounds.
Do	Philippine Islands (hemp)	139.45 pounds.
Do	Philippine Islands (sugar)	140 pounds.
Pie	Argentine Republic	0.9478 foot.
Do	Castile	0.91407 foot.
Pik	Turkey	27.9 inches.
Pood	Russia	36.112 pounds.
Pund (pound)	Denmark and Sweden	1.102 pounds.
Quarter	Great Britain	8.252 bushels.
Do	London (coal)	36 bushels.
Quintal	Argentine Republic	101.42 pounds.
Do	Brazil	130.06 pounds.
Do	Castile, Chile, Mexico, and Peru	101.61 pounds.
Do	Greece	123.2 pounds.
Do	Newfoundland (fish)	112 pounds.
Do	Paraguay	100 pounds.
Do	Syria	125 pounds.
Do	Metric	220.46 pounds.
Rottle	Palestine	6 pounds.
Do	Syria	5¼ pounds.
Sagen	Russia	7 feet.
Salm	Malta	490 pounds.
Se	Japan	0.02451 acres.
Seer	India	1 pound 13 ounces.
Shaku	Japan	11.9305 inches.
Sho	do	1.6 quarts.
Standard (St. Petersburg)	Lumber measure	165 cubic feet.
Stone	British	14 pounds.
Suerte	Uruguay	2,700 cuadras (see cuadra).
Sun	Japan	1.193 inches.
Tael	Cochin China	590.75 grains (troy).
Tan	Japan	0.25 acre.
To	do	2 pecks.
Ton	Space measure	40 cubic feet.
Tonde (cereals)	Denmark	3.94783 bushels.
Tondeland	do	1.36 acres.
Tsubo	Japan	6 feet square.
Tsun	China	1.41 inches.
Tunna	Sweden	4.5 bushels.
Tunnland	do	1.22 acres.

Foreign weights and measures, with American equivalents—Continued.

Denominations.	Where used.	American equivalents.
Vara	Argentine Republic	34.1208 inches.
Do	Castile	0.914117 yard.
Do	Central America	32.87 inches.
Do	Chile and Peru	33.367 inches.
Do	Cuba	33.384 inches.
Do	Curaçao	33.375 inches.
Do	Mexico	33 inches.
Do	Paraguay	34 inches.
Do	Venezuela	33.384 inches.
Vedro	Russia	2.707 gallons.
Vergees	Isle of Jersey	71.1 square rods.
Verst	Russia	0.663 mile.
Vlocka	Russian Poland	41.98 acres.

METRIC WEIGHTS AND MEASURES.

Metric weights.

Milligram ($\frac{1}{1000}$ gram) equals 0.0154 grain.
Centigram ($\frac{1}{100}$ gram) equals 0.1543 grain.
Decigram ($\frac{1}{10}$ gram) equals 1.5432 grains.
Gram equals 15.432 grains.
Decagram (10 grams) equals 0.3527 ounce.
Hectogram (100 grams) equals 3.5274 ounces.
Kilogram (1,000 grams) equals 2.2046 pounds.
Myriagram (10,000 grams) equals 22.046 pounds.
Quintal (100,000 grams) equals 220.46 pounds.
Millier or tonnea—ton (1,000,000 grams) equals 2,204.6 pounds.

Metric dry measures.

Milliliter ($\frac{1}{1000}$ liter) equals 0.061 cubic inch.
Centiliter ($\frac{1}{100}$ liter) equals 0.6102 cubic inch.
Deciliter ($\frac{1}{10}$ liter) equals 6.1022 cubic inches.
Liter equals 0.908 quart.
Decaliter (10 liters) equals 9.08 quarts.
Hectoliter (100 liters) equals 2.838 bushels.
Kiloliter (1,000 liters) equals 1.308 cubic yards.

Metric liquid measures.

Milliliter ($\frac{1}{1000}$ liter) equals 0.0388 fluid ounce.
Centiliter ($\frac{1}{100}$ liter) equals 0.338 fluid ounce.
Deciliter ($\frac{1}{10}$ liter) equals 0.845 gill.
Liter equals 1.0567 quarts.
Decaliter (10 liters) equals 2.6418 gallons.
Hectoliter (100 liters) equals 26.417 gallons.
Kiloliter (1,000 liters) equals 264.18 gallons.

Metric measures of length.

Millimeter ($\frac{1}{1000}$ meter) equals 0.0394 inch.
Centimeter ($\frac{1}{100}$ meter) equals 0.3937 inch.
Decimeter ($\frac{1}{10}$ meter) equals 3.937 inches.
Meter equals 39.37 inches.

Decameter (10 meters) equals 393.7 inches.
Hectometer (100 meters) equals 328 feet 1 inch.
Kilometer (1,000 meters) equals 0.62137 mile (3,280 feet 10 inches).
Myriameter (10,000 meters) equals 6.2137 miles.

Metric surface measures.

Centare (1 square meter) equals 1,550 square inches.
Are (100 square meters) equals 119.6 square yards.
Hectare (10,000 square meters) equals 2.471 acres.

DEPARTMENT INSTRUCTION.

Department of State,
Washington, June 20, 1899.

To the Consular Officers of the United States.

Gentlemen: In the interest of the merchant marine of this country, you will please investigate the condition of the merchant marine in the countries in which you are respectively located and the policy adopted by the government for its promotion, and make a full report to the Department on the subject.

The following lines of inquiry are suggested to you to indicate the nature and extent of your investigation and report:

(1) State the condition, extent, and importance of the merchant marine in the country in which you are situated.

(2) What policy does the government pursue to promote its merchant marine?

(3) State any recent changes in policy and how long and with what vigor they have been pursued.

(4) To what extent are war ships built in the country in which you are situated and what effect does their building have upon the cost of constructing merchant ships?

(5) State as concisely as possible, but by quotation where desirable, what department or bureau of government supervises the merchant marine and such recommendations as they have recently made for its betterment.

(6) Refer to or quote from, where desirable, reports of parliamentary or other official committees on the subject of the merchant marine, together with suggestions or recommendations made. This applies also to reports on increasing the efficiency of mail carriage by steamships, and upon the necessity and usefulness of such ships for auxiliary naval purposes.

(7) To what extent, officially or publicly, are the policies of other nations toward their merchant shipping discussed, criticised, or copied?

(8) To what extent do chambers of commerce, boards of trade, and like organizations discuss the subject of the merchant marine, and what recommendations of value are made?

(9) State whether the principal materials of shipbuilding—plates and structural forms for steel vessels and timber or lumber—are produced in the country or imported from abroad.

(10) State the current prices of steel plates for the hulls of vessels.

(11) State the average weekly wages in shipyards paid to pattern makers, machinists, riveters, ship carpenters, joiners, painters, furnace men, riggers, plumbers, sheet-iron workers, iron molders, brass molders, and laborers.

(12) State the average monthly wages of the port paid in the foreign trade on steam vessels and sail vessels (various nationalities), respectively, to able seamen, boatswains, carpenters, quartermasters, first mates, second mates, and, in addition, on steam vessels to firemen, coal passers, oilers, first engineers, second engineers, third engineers.

I am, etc.,

THOS. W. CRIDLER,
Third Assistant Secretary.

MERCHANT MARINE OF FOREIGN COUNTRIES.

AUSTRIA.

In response to the Department circular of June 20, 1899, instructing consular officers to investigate the condition of the merchant marine in the countries where they are respectively located and the policy adopted by the Government for its promotion, I have to report as follows:

CONDITION OF MERCHANT MARINE.

The merchant marine of Austria can not be said to be in an indisputably prosperous condition. During the past ten years, there has been no appreciable increase either in the number of vessels or in tonnage, and there has been a decrease in the number of seamen, as the following table will show:

State of the merchant marine of Austria from 1889 to 1898.

Year.	Number of vessels.	Tonnage.	Seamen.
1889	1,782	179,787	8,061
1890	1,748	176,042	7.910
1891	1.723	173,776	7.767
1892	1,717	167.651	7.749
1893	1,720	166.034	7.732
1894	1,674	157,946	7,365
1895	1,693	165,550	7.571
1896	1,708	174,593	7.709
1897	1,705	189,744	7,835
1898	1,659	185,923	7,525

It will be noticed that in 1894 Austria's shipping was at its lowest ebb. At that time the present bounty system was adopted by the Government, and under it the total tonnage of all merchant vessels increased from 157,946 tons in 1894 to 189,744 tons in 1897. There was, however, a slight decrease in tonnage again last year, together with a very noticeable decrease in the number of vessels and seamen. The various changes of 1898 are shown in the following table:

Increase and decrease of merchant marine during the year 1898.

Description.	For long voyages.				Long coasting.				Short coasting.			
	Sailing.		Steam.		Sailing.		Steam.		Sailing.		Steam.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
Increase.												
New ships (Austrian)	......	......	......	......	......	......	......	......	24	238	2	62
From long coasting	......	......	......	......	......	......	......	......	2	18	......	......
Purchased abroad	1	646	7	12,424	......	......	1	200	2	23	......	......
Tonnage increased	......	44	......	44	......	......	......	......	......	......	......	......
Formerly in local use	......	......	......	......	......	......	......	......	1	4	1	7
Transferred from other ports	1	431	......	......	1	63	6	1,298	14	259	......	......
Changed class	......	......	......	......	......	......	1	792	5	103	2	696
Total	2	1,121	7	12,468	1	63	8	2,290	48	645	5	765
Decrease.												
Shipwrecked	3	1.553	3	3,298	......	......	1	456	6	61	......	......
Broken up	......	......	......	......	......	......	......	......	18	167	1	597
Sold abroad	11	5.590	4	3,414	6	860	2	1,076	20	346	2	26
Dismantled	......	......	......	......	......	......	......	......	4	52	......	......
Diminished in tonnage	......	51	......	423	......	......	......	10	......	57	......	......
Passed to local use	......	......	......	......	......	......	......	......	7	46	......	......
Passed to other jurisdiction	......	......	......	......	1	63	6	1,298	18	323	......	......
Passed to other class	......	......	2	1,402	......	......	......	......	2	4	......	......
Total	14	7.194	9	8,537	7	923	9	2,840	75	1,056	3	623
Increase	......	......	......	3,931	......	......	......	......	......	......	2	142
Decrease	12	6,073	2	......	6	860	1	550	27	411	......	......

The exact state of Austria's marine at the close of 1898 was as follows:

Description.	Number.	Tonnage.	Seamen.	Horsepower.
Sailing vessels.				
Long voyage	35	20,319	364	......
Long coasting	20	2,101	98	......
Short coasting	1,426	17,104	3.545	......
Total	1,481	39.524	4.007	......
Steamers.				
Long voyage	93	136,570	2,799	121,835
Long coasting	20	5.516	286	8,164
Short coasting	65	4.313	433	13.590
Total	178	146,399	3.518	143,589
Sailing vessels and steamers.				
Long voyage	128	156,889	3.163	121,835
Long coasting	40	7,617	384	8,164
Short coasting	1,491	21,417	3.978	13,590
Total	1,659	185,923	7.525	143.589

During the year 1898, out of a total of 1,813,684 tons representing the imports and exports of the Empire by sea, 1,145,802 tons, or 63 per cent, was carried in Austrian bottoms.

BOUNTIES.

Previous to the year 1893, the only aid which the Government gave to the mercantile marine was a liberal subvention to the Austrian Lloyd Steamship Navigation Company for carrying the mails. During the eleven years 1882–1893, there was a noticeable decrease in the number as well as in the total tonnage of vessels engaged in long voyages. While in 1882 the number of vessels engaged in foreign trade was 348, with a total tonnage of 208,102 tons, there were in 1893 only 165 such vessels, with a total tonnage of 133,447 tons.

It was noticed that while Austrian shipping declined, the tonnage of the adjoining countries, Hungary and Italy, showed a remarkable increase; and, as the Governments of these States were paying liberal subsidies to their merchant ships, it was believed that Austria's inability to compete with her neighbors in the carrying trade was solely due to the failure of her Government to afford adequate protection to shipping interests.

The Trieste Chamber of Commerce, in May, 1893, petitioned the Government to accord to Austrian shipowners exemption from taxes and to offer bounties or premiums on the building of ships and on long voyages, similar to those given by the Italian, French, and Hungarian Governments to the shipowners of their respective countries. This petition received the hearty indorsement of all the chambers of commerce in the Empire, and the unanimity of sentiment thus shown induced the Government to present to Parliament, in October, 1893, a ship-subvention bill. This bill was passed on November 28 of the same year and became a law on December 27, 1893. The provisions of the law are substantially as follows:

ARTICLE 1. Steamers and sailing vessels inscribed on the Austrian register as making long voyages or engaged in the long coasting trade may avail themselves of the following benefits: (*a*) An annual State bounty; (*b*) a tonnage and distance premium for each voyage made.

ART. 2. The annual bounty is paid to every ship engaged in the foreign or long coasting trade, provided: (1) Austrian subjects own at least a two-thirds interest in the same; (2) not more than fifteen years have elapsed since it was launched; (3) it is registered under Class A 1 or 2 in the Austro-Hungarian "Veritas" or a similar insurance association.

ART. 3. The bounty for the year following the launching of a ship is as follows:

Class.	Kind of vessel.	Per ton (net).	
		Florins.	
1	For iron or steel steamship	6.00	$2.43
2	For iron or steel sailing ship	4.50	1.83
3	For wooden or mixed sailing ship	3.00	1.22

ART. 4. Sailing vessels built of steel or iron in Austrian shipyards have their bounties increased by 10 per cent; and if at least half of the raw material used is of Austrian origin, the bounty is increased by 25 per cent.

ART. 5. If more than one year has elapsed since the launching of a ship that applies for and has a right to the bounty, the same shall be computed as for the first year (see article 3), and a deduction of 5 per cent shall be made for each year that has passed since the ship was launched. The bounty ceases when a ship has been launched fifteen years.

ART. 6. Ships registered before July 1, 1893, may receive, when fifteen years from the time they were launched shall have elapsed, 1 florin (40 cents) per ton net per year for five years, dating from January 1, 1894, provided they be classed at least B2 in the Austro-Hungarian "Veritas," or in any other Austrian insurance association.

ART. 7. Ships mentioned in article 1 shall receive the bounty only if engaged in the carrying trade outside the statutory short coasting lines, and if touching Austrian ports not touched by steamers plying in parallel lines already receiving State subsidy. The bounty shall be 5 kreutzers (2 cents) per ton for every 100 nautical miles, the distance to be computed by taking the shortest line.

ART. 8. A vessel remaining without a crew or lying idle in port for more than six months loses all claim to the bounty or premium.

ART. 9. All mercantile vessels shall be exempt from Government income and other taxes for five years after January 1, 1894. Also, all vessels built in Austrian yards after the passage of the law shall be exempt from all taxation for five years.

ART. 10. The law does not apply (*a*) to ships already receiving State subsidies; (*b*) to regular lines having mail contracts; (*c*) to ships belonging to an industrial establishment or lines engaged in carrying their own goods.

ART. 11. The bounties shall be paid at the end of each year, dating from the launching of the ship.

ART. 12. Ships which have been built abroad and have received a bounty while under the Austrian flag shall refund the entire amount received by them if they pass under a foreign flag before three years have elapsed since they received such bounty.

Furthermore, ships which have been built in Austrian yards and have received a State bounty shall refund the entire amount received by them if they are sold to a foreign nation within two years after they have received such bounty.

ART. 13. In case of war or mobilization, shipowners benefited by the present law beyond the exemption from taxation provided for in article 9 must, when requested, place their ships at the disposal of the Government for a reasonable indemnity.

ART. 14. The regulations necessary for the enforcement of the law shall be made by ministerial order.

ART. 15. When this bill becomes a law, all laws in conflict with it are repealed.

ART. 16. The law shall take effect on January 1, 1894, and remain in force for a period of ten years.

ART. 17. The Minister of Commerce and the Minister of Finance are charged with the execution of the law.

Last year, article 9 of the subsidy law was so amended as to exempt all ships from taxation another five years. Beyond this, there has been no change in the law or in the attitude of the Government toward the same.

As regards the matter of subsidies granted to steamers for mail carriage, Austria has for years had a well-settled policy and there has been no movement to change it either in or out of Parliament.

The Government pays to various steamship companies for mail carriage about $1,300,000, of which the Austrian Lloyd receives more than 90 per cent.

WAR SHIPS.

Nearly all the war ships of Austria-Hungary have been built at home, the majority in the imperial navy-yard at Pola, and five or six cruisers and a dozen torpedo boats by the Stabilimento Tecnico, of Trieste. The last-mentioned company has also built a number of war ships for the Argentine Republic, Uruguay, and Roumania. The building of war ships at Trieste is said to have no noticeable effect upon the cost of constructing merchant ships.

SUPERVISION OF MERCHANT MARINE.

The supervision of the merchant marine is intrusted to the Governo Marittimo (maritime board), a bureau under the Ministry of Commerce. The board has its seat in Trieste and is presided over by a president, who in executive matters is assisted by five division chiefs. These chiefs have charge of the following "sections," or subbureaus, respectively: (1) The nautical section; (2) the technical section; (3) the inspectorate of fisheries; (4) the accounting department; (5) the archive and correspondence department.

The board has not only executive, but, to a certain extent, legislative functions as well. When it meets in its legislative capacity, the meetings or conferences are attended by twelve consulting delegates, who are elected by the chambers of commerce of the five principal ports of the Empire, Trieste electing four and Rovigno, Zara, Spalato, and Ragusa-Cattaro two delegates each. The coast is divided into eight port districts, and each district is again subdivided into "agencies."

Since the enactment of the present law, no recommendations have been made by the maritime board for the betterment of the merchant marine. The law is to be in force for a period of ten years, and may therefore be said to be still on trial. No changes are at present contemplated, and none are likely to be made until after the expiration of this period.

As has already been indicated, the merchant marine has received in this country but very little attention during the past five years. Both the Government and the public are watching the effects of the law. Some people are satisfied with it, while others are disappointed; but the majority seem to be of the opinion that it is too early to pass final judgment upon the efficacy of the measure. The subject has not been discussed in Parliament since 1893, when the subsidy bill was under consideration.

A special committee was then appointed by Parliament to investigate and report upon the condition of the merchant marine and to make recommendations for its betterment. I make the following quotations from its report:

> During a number of years, our mercantile marine has suffered a continual decline. * * * The causes of the decline are partly of a general and partly of a special character. There has been no increase in the demand for freight in our ports, especially in Trieste, our most important emporium. This has caused a decrease in shipping facilities. * * * As to our foreign carrying trade, in which our ships formerly were actively and profitably engaged, competition from both sailing and steam vessels has become greater and keener than it ever was before. * * * Our shipowners were not in a position to face such a crisis. Unable to change their old ships for improved vessels, they were obliged to get rid of them at a considerable sacrifice, which they preferred to a losing trade. * * * But the importance of keeping up our mercantile marine should not be overlooked, and our mistake would be still greater if we became indifferent as to whether our goods be carried in foreign bottoms or by our own ships. Shipowners and merchants are linked together. * * * The inhabitants of our coasts possess very limited means, and, as the soil is not everywhere fertile, they have for generations taken to navigation, for which they have ever shown great fitness. * * * This decline is a calamity for our people along the coast, and, besides, threatens to abandon our carrying trade to foreign ships. * * * What is wanted is to put a stop to the decline of our merchant fleet, to allow it to cope with foreign competition, and to secure for the inhabitants of our coast wonted employment and profits in maritime pursuits.

The Austrian public takes at present but little interest in the attitude of other nations toward their merchant shipping. While the bounty and subsidy law is on trial, discussion relating to the subject is, as it were, suspended by general consent. Trade and technical papers, of course, occasionally discuss these matters; but they do not have the public ear.

The preceding remarks apply also to chambers of commerce and similar organizations. As regards the betterment of the merchant marine, no recommendations of special interest or value have been made by them recently; but in 1892 and 1893, the agitation in favor of the present bounty and subsidy law was commenced by the various chambers of commerce, and the act of December 27, 1893, practically incorporated the measures recommended by these bodies.

MATERIALS FOR SHIPBUILDING.

The principal materials used in shipbuilding, such as iron, steel, copper, lead, timber, etc., are produced in Austria; but considerable quantities of metal have also been imported during the past few years, and these imports are on the increase. A few mechanical accessories—mostly patented articles—are almost exclusively imported from England, and teak and pitch pine come from India and America.

The Stabilimento Tecnico Triestino, the principal shipbuilding establishment of Trieste, informs me that the current price of Austrian steel plates for the hulls of vessels is from 100 to 110 florins ($40.60 to $44.66) per 1,000 kilograms (2,204.6 pounds).

WAGES.

The average weekly wages paid in the shipyards of Trieste are as follows:

Workmen.	Wages.		Workmen.	Wages.	
	Florins.			*Florins.*	
Pattern makers	12 to 15	$4.87 to $6.09	Riggers	11 to 14	$4.47 to $5.68
Machinists	12 to 15	4.87 to 6.09	Plumbers	10 to 12	4.06 to 4.87
Riveters	15 to 18	6.09 to 7.31	Sheet-iron workers	12 to 15	4.87 to 6.09
Ship carpenters	12 to 15	4.87 to 6.09	Iron molders	12 to 15	4.87 to 6.09
Joiners	10 to 12	4.06 to 4.87	Brass molders	12 to 15	4.87 to 6.09
Painters	9 to 12	3.65 to 4.87	Laborers	7 to 9	2.84 to 3.65
Furnace men	12 to 15	4.87 to 6.09			

The following table gives the average monthly wages paid in this port to officers and seamen of Austrian, Italian, German, and British vessels. Seamen of other nationalities are comparatively scarce here and have no recognized scale of wages. When such seamen are hired, they are, as a rule, paid Austrian wages. The wages on steam and sail vessels are substantially the same for common seamen. Officers, however, receive, as a rule, from 50 to 75 per cent more on steamers than on sailing vessels.

Rates of monthly wages paid at Trieste to officers and seamen on Austrian, Italian, German, and British vessels.

Class.	Austrian.	Italian.	German.	British.
Mates:				
On steamers	$38.92	$43.75	$28.56 to $35.70	$58.38
On sail vessels	21.89	26.25	23.80 to 28.56	....
Second mates:				
On steamers	24.32	30.62	23.80	43.79
On sail vessels	17.03	17.50	19.04 to 23.80	....
Boatswains and carpenters	17.03	$11.38 to 14.00	19.04 to 21.42	29.19
Quartermasters	14.00	10.00 to 13.00	19.04	25.55
Seamen	12.16	9.63	11.90 to 16.66	24.33
First engineers	$58.38 to 77.84	61.25	59.50	$58.38 to 68.11
Second engineers	34.06 to 48.65	45.98	28.56	46.22
Third engineers	19.46 to 29.19	30.62	23.80	27.36
Oilers	14.60	12.00	13.00 to 17.00	25.00 to 26.00
Coal passers	12.16	11.38	12.00 to 15.00	24.00 to 25.00
Firemen	15.82	12.25	14.28 to 19.04	26.76

FREDK. W. HOSSFELD,
Consul.

TRIESTE, *September 14, 1899.*

BELGIUM.

CONDITION OF MERCHANT MARINE.

The merchant marine of Belgium consists of 66 vessels, with a total measurement of 90,971 tons. Of this number of craft in existence on the 31st of December, 1898, 62 of 90,629 tons belonged to the port of Antwerp, 1 of 160 tons to Louvain, 1 of 69 tons to Nieuport, and 2 of 113 tons to Ostende.

The following table shows the status of the merchant marine of the country from the year 1859 to the commencement of the present year:

Year.	Number of vessels.			Tonnage of vessels.			Average tonnage per vessel.	
	Sailing.	Steam.	Total.	Sailing.	Steam.	Total.	Sailing.	Steam.
1859	131	4	135	35,632	1,559	37,191	272	390
1860	108	8	116	28,857	4,254	33,111	267	532
1861	103	8	111	27,252	4,484	31,736	265	560
1862	96	7	103	25,663	3,284	28,947	267	469
1863	91	6	97	24,533	2,714	27,247	270	452
1864	99	8	107	30,902	4,075	34,977	312	509
1865	104	8	112	35,509	4,220	39,729	341	527
1866	91	7	98	33,239	4,686	37,925	365	669
1867	81	9	90	31,198	6,357	37,555	385	706
1868	68	11	79	23,141	8,752	31,893	340	796
1869	67	12	79	23,981	8,762	32,743	358	730
1870	55	12	67	20,648	9,501	30,149	375	791
1871	48	12	60	17,262	8,742	26,004	360	728
1872	40	19	59	16,205	16,141	32,346	405	850
1873	41	28	69	16,434	30,005	46,439	401	1,072
1874	33	24	57	14,925	30,397	45,322	452	1,267
1875	32	27	59	14,756	35,430	50,186	461	1,312
1876	25	23	48	15,130	29,850	44,980	605	1,298
1877	22	28	50	10,547	37,858	48,405	479	1,352
1878	24	34	58	10,319	50,389	60,708	430	1,482
1879	25	39	64	11,655	59,536	71,191	466	1,527
1880	24	42	66	10,442	65,224	75,666	435	1,553
1881	18	41	59	7,354	70,486	77,840	409	1,719
1882	16	46	62	6,750	75,897	82,647	422	1,650
1883	15	47	62	6,458	79,902	86,360	431	1,700
1884	13	51	64	5,925	74,667	80,592	455	1,464
1885	11	54	65	5,053	79,809	84,862	459	1,478
1886	12	55	67	5,554	81,283	86,837	463	1,478
1887	10	55	65	5,500	80,891	86,391	550	1,471
1888	9	50	59	4,271	73,384	77,655	475	1,468
1889	9	42	51	4,271	65,951	70,222	475	1,570
1890	10	46	56	4,393	71,553	75,946	439	1,555
1891	8	47	55	2,045	70,860	72,905	256	1,508
1892	6	47	53	1,039	69,356	70,395	173	1,476
1893	6	50	56	1,039	74,499	75,538	173	1,490
1894	5	50	55	917	78,271	79,188	183	1,565
1895	5	54	59	917	86,296	87,213	183	1,598
1896	5	53	58	917	84,822	85,739	183	1,600
1897	5	56	61	917	84,510	85,427	183	1,509
1898	6	60	66	1,734	89,237	90,971	289	1,487

The fleet, as before mentioned, is constituted of steamers, with the exception of 5 sailing craft and 1 auxiliary.

Among the number of steamers are included 9 belonging to the Red Star Line.

With the exception of the last named, most of the vessels forming the fleet are of comparatively small tonnage.

The State also owns 13 steamers, 2 sailing vessels, and 1 auxiliary, most of which are employed in the postal and passenger service between Ostende and Dover.

GOVERNMENT POLICY.

It can not be said that, up to this time, the Government has adopted any line of policy whatever in regard to promoting the interests of its merchant marine. The King, at the time of his reception here by the chamber of commerce,* expressed a desire that his people might give attention to creating one. He had undoubtedly in view at that time the increasing importance of the commercial relations of this country with the Kongo Free State. Since the date of this speech, capitalists have interested themselves to a certain extent in ascertaining what might be achieved in this direction, but as yet have taken no determined steps.

The former minister charged with the supervision of the merchant marine was approached by the representatives of the parties above referred to, with a view of ascertaining what assistance could be expected from the State in the event of a company or companies being formed in order to further the merchant marine. As stated by himself, he promised to take the matter under consideration and expressed his desire to aid the project as far as compatible with the policy and interests of the Government. The ministry having recently been changed, it remains to be seen what measures, if any, the new one will take in this direction.

This country possesses no navy, and no war ships are built here. The merchant marine is under the supervision of the Ministry of Railroads, Post, and Telegraph; but, so far as I know, no recommendations looking towards its betterment have been made of late by this department of the Government. Neither has it been possible for me to learn of any reports of Parliamentary or other official committees on the subject referred to. The policies of other nations adopted in the treatment of their shipping interests are of course occasionally discussed in the press and chambers of commerce, but in a general way rather than with reference to the subject at hand.

---

*See Consular Reports No. 220 (January, 1899); Advance Sheets No. 278 (November 19, 1898).

MATERIALS FOR SHIPBUILDING.

Such plates and structural forms for steel vessels as are built here are produced in this country. The lumber, as a rule, is imported. There are no quotations of prices for steel plates obtainable, as the shipbuilding interests of this country are of comparatively small importance. To illustrate, the only establishment located in Belgium known to me constructed in all, during the year last past, some thirty-four vessels, the greater part of which were destined for river navigation in the Kongo Free State.

WAGES.

Information in regard to wages paid in the shipyards here is impossible to obtain; the greater part of the work, however, is job or piece work done on contract. According to the report of the chamber of commerce of this city for last year, the wages paid vary from 15 cents for boy apprentices to $1.25 a day for workmen.

The following table gives the average monthly wages paid at this port on steam vessels in the foreign trade:

Rates of wages paid at the port of Antwerp.

Description.	Société Anonyme Belge du Congo.	Bordeaux-Mediterranean-Hamburg.	Congo-Cokerill.	Tank steamers.	Red Star Line
Chief officer	$62.72½	$38.60	$38.60	$28.25	$62.72½ to $72.37½
Second officer	38.60	24.12½	24.12½	33.77½	53.07½ to 57.90
Third officer	28.95	...	...	24.12½	43.42½ to 28.25
Fourth officer	18.33½	...	...	...	38.60
Boatswain	...	19.30	19.30	24.12½	28.95
Second boatswain	...	...	...	...	24.12½
Carpenter	28.95	21.62	...	24.12½	28.95
Quartermaster	...	...	...	...	21.71
Seaman	17.37	17.27	16.79	19.30	19.30
Chief engineer	77.20	67.55	67.55	77.20	96.50 to 115.80
Second engineer	57.90	38.60	38.60	57.90	69.96 to 72.37½
Third engineer	43.42½	28.95	28.95	43.42½	55.49 to 57.90
Fourth engineer	36.19	...	...	33.77½	52.66 to 53.07½
Storekeeper	...	...	...	...	28.95
Donkey man	...	...	23.16	24.12½	21.71 to 23.60
Oiler	...	...	...	23.16	23.60
Fireman	19.30	19.30	19.30	21.62	21.71
Trimmer	$16.40 to 16.79	16.89	16.89	16.40	16.89

State.

Class.	Wages per month.	Class.	Wages per month.
Engineer:		Boatswain:	
First class—		Maximum	$23.48
Maximum	$56.29	Minimum	22.51½
Minimum	48.25	Sailors, passenger:	
Second class	43.52	Maximum	21.87
Third class—		Minimum	20.91
Maximum	36.99	Guard boat:	
Minimum	31.18	Maximum	21.87
Fourth-class assistant—		Minimum	19.94
Maximum	28.95	Auxiliary:	
Medium	36.54	Maximum	14.47½
Minimum	24.12½	Minimum	8.68½
Head fireman:		Head steward	14.47½
Maximum	23.48	Head waiter	9.65
Minimum	22.51½	Boots:	
Fireman:		Maximum	8.68½
Maximum	21.87	Minimum	7.72
Minimum	20.91	Pantry man	6.57½
Quartermaster:		Scullery man:	
Maximum	28.95	Maximum	6.57½
Minimum	25.73	Minimum	5.79

GEO. F. LINCOLN,
Consul-General.

ANTWERP, *August 18, 1899.*

DENMARK.

CONDITION OF MERCHANT MARINE.

The Danish merchant marine consisted, on the 1st of March, 1899, of 3,170 sailing vessels of a gross tonnage of 186,000 tons and 505 steamers of a gross tonnage of 387,200 tons, against 3,199 sailing vessels of a gross tonnage of 192,100 tons and 442 steamers of a gross tonnage of 276,800 tons on the 1st of April, 1897. As to the condition of the same, there are 7 sailing vessels over one hundred years old—1 dating from 1776, 2 from 1786, 2 from 1794, and 2 from 1796. There are about 160 sailing vessels fifty years old.

The largest iron sailing vessel is the *Sixtus* (1,817 tons)—the largest wooden vessel *Hydra* (820 tons). Of wooden vessels, there are only 5 of over 500 tons, and of steel and iron vessels, only 69 of over 500 tons.

The sailing vessels are principally built of wood, but during the last twelve years nearly all those bought abroad are of steel or iron. The steamers are nearly all screw boats, except about 7 per cent paddle steamers.

As to age, 1 is forty-four years old, 2 are forty-three years old, and 1 is forty-one years old. About 7 per cent are over thirty years old, 20 per cent are between twenty and thirty years, 27 per cent are between ten and twenty years, and 46 per cent are less than ten years. As to the material used, 50 per cent may be said to be of iron, 47 per cent of steel, and 3 per cent of wood. As to the place of building, 27 per cent of the vessels are built in Denmark, 10 per cent in Sweden, 11 per cent in Germany, and 52 per cent in Great Britain.

The largest steamship owner in Denmark is the United Steamship Company, Limited, of Copenhagen, with 121 steamers of 109,820 gross tonnage.

GOVERNMENT POLICY.

The Government promotes the merchant marine by regulating the laws in favor of the same, and the year 1892 was especially rich in forming new laws; since then, several laws have come into force. These are contained in a book published by the chief of navigation, J. A. D. Jensen, which can be bought.

There is no special department or bureau of the Government, but the Navy Department, the Department of the Interior, the Department of Agriculture, the Foreign Office, and especially the ship registration and measuring bureau all have a voice in the various matters pertaining to the Danish merchant marine.

A committee is at present working on the revision of the inspection rules for passenger steamers, and it is expected that in the near future a committee will be appointed to revise the qualification rules for officers in Danish ships.

The Danish mails are not as a rule carried by Danish steamers, except the mails to and from the Continent and to Iceland and Faroe Islands.

None of the Danish steamers could be used for auxiliary naval purposes.

WAR VESSELS.

The royal Danish war ships are built exclusively by the Government itself, at the royal navy-yards, and their building has no effect whatever upon the cost of constructing merchant ships.

PUBLIC INTEREST.

The subject of the Danish merchant marine is very little discussed. There is a Danish shipping gazette, but the reports are mostly from British sources. The committee of the second northern maritime conference held a meeting in 1888 in Copenhagen, and I inclose its report.* It was discussed at the International Maritime Conference held at Washington in 1889.

---

* Transmitted to the Commissioner of Navigation.

MATERIALS FOR SHIPBUILDING.

Iron and steel for shipbuilding are imported from Germany, Great Britain, and the United States, and lumber and timber from Sweden, Finland, the Baltic, and Canada.

The average prices for steel plates were:

	£	s.	d.	
1897	5	8	2	=$26.25
1898	6	0	0	= 29.16
1899	7	5	0	= 35.23

Cost, freight, and insurance Copenhagen.

WAGES.

The following shows the average weekly wages paid in shipyards:

Workmen.	Wages.	Workmen.	Wages.
Pattern makers	$8.58 to $10.18	Plumbers	$8.84 to $9.65
Machinists	8.04 to 10.18	Coppersmiths	10.18 to 10.72
Riveters	8.30 to 8.86	Sheet-iron workers	9.11 to 9.63
Painters	12.32	Laborers	6.97
Riggers	8.84	Molders	8.04 to 8.58

The monthly wages of the port of Copenhagen in the foreign trade are:

Class.	Steamers.	Sailing vessels.
First mate	$29.48	$25.46
Second mate	20.10	18.76
Carpenter	18.22	18.22
Boatswain	17.42	17.42
Able seamen	16.08	16.08
First engineer	$53.60 to 93.80	....
Second engineer	32.16 to 53.60	....
Third engineer	26.80	....
Firemen and coal passers	16.08	....

JULES BLOM,
Vice and Deputy Consul.

COPENHAGEN, *July 29, 1899.*

FRANCE.

HAVRE.

CONDITION OF FRENCH MERCHANT MARINE.

The statesmen of France, her lawmakers, her ship owners and builders, and others whose interests are closely allied with those of commerce and navigation, are keenly appreciative of the present unsatisfactory condition of the French merchant marine.

The report of the committee of the House of Deputies, appointed to examine the budget of the Minister of Commerce for 1899, says:

> We do not hesitate to say without any fear of contradiction that our merchant marine is in such a state of decadence that there is reason to be uneasy about our naval fleet.
>
> It is no longer a question, as is the case with the merchant marine of England and Germany, of competing with foreign ships in their own ports. We have seen from the statistics of navigation that even in French ports we find it difficult to obtain a proper share of our own freight.

The following figures giving the percentage of the movement of navigation in French ports of vessels of this nation since 1875, taking into consideration the trade with foreign countries only, would seem to justify the above statement:

Year.	Entries.	Clearances.	Entries and clearances.
	Per cent.	*Per cent.*	*Per cent.*
1875	26	33	29
1885	29	32	26
1895	22	29	24

Comparing the first six months of 1898 with the same period of 1897, it will be seen that the statistics are even more unfavorable for French commerce:

First six months of—	Entries.	Clearances.	Entries and clearances.
	Per cent.	*Per cent.*	*Per cent.*
1897	23.1	30.9	26.3
1898	19.2	28.6	22.9

Mr. Charles Roux, in his able study of the French merchant navy,* says:

> The decadence which is menacing us is increasing every day, and if we do not take care it is to be feared that before the formidable élan of foreign fleets our merchant navy, in a very brief time, will fall into complete ruin.

---

* Notre Marine Marchande, by Charles Roux; Paris, 1898.

Many other extracts might be quoted from the reports of various chambers of commerce, from speeches made in the two houses of Parliament, and from lectures delivered by experts in economics, all lamenting the depressed state of the merchant navy of France.

According to the statistics furnished by Lloyd's Register for 1899, the number of French steamers of 100 gross tons and upwards recorded in the register book was 639, of a net tonnage of 516,096 and of a gross tonnage of 997,235. Of these, 10 were built of wood of 1,488 gross tons, 1 was composite built of 566 gross tons, 368 were of iron of 512,327 gross tons, and 260 of steel of 482,854 gross tons.

The number of sailing vessels of 100 tons burden and upwards was 543, of a net tonnage of 244,856 tons. Of these, 409 were built of wood, measuring 74,789 net tons; 1 composite built, 461 net tons; 61 of iron, 51,028 net tons; and 72 of steel, gauging 118,578 tons.

According to the report of the subcommittee of the extra-Parliamentary committee, which was afterwards adopted by the whole committee—

> From 1893 to 1898, 253,939 tons of steamers of over 100 gross tons were registered under the French flag. Of this amount, 157,643 tons were old vessels, and 96,296 tons only were steamers of new construction—37 per cent of the total.

The following statistics of the sail and steam tonnage under the seven flags of England, Germany, France, Italy, Norway, Sweden, and Japan were taken from the same report:

Gross tonnage of steamers over 100 tons.

Nationality.	July 1, 1893.	July 1, 1898.	Increase.	
	Tons.	*Tons.*	*Tons.*	*Per cent.*
British	9,544,394	11,168,189	1,623,795	17
German	1,125,952	1,644,687	518,385	47
French	907,029	973,960	66,961	7.3
Italian	319,327	441,585	122,258	38.3
Norwegian	371,844	618,617	246,773	66
Swedish	221,152	328,555	106,403	47
Japanese	151,773	454,163	302,390	200

Net tonnage of sailing vessels over 100 tons.

Nationality.	1893.	1898.	Increase or decrease.	
	Tons.	*Tons.*	*Tons.*	*Per cent.*
British	3,243,888	2,497,123	−746,765	−23
German	609,731	469,644	−148,087	−23
French	196,224	206,898	+ 10,674	+ 5.4
Italian	476,920	413,893	− 63,027	−13.2
Norwegian	1,338,469	1,024,600	−313,869	−23.4
Swedish	280,538	224,630	− 56,308	−20.1
Japanese	21,510	17,890	− 3,620	−16.8

While the nations named in the above tables have increased their steam tonnage in five years from 17 per cent (the percentage of increase of Great Britain) to 200 per cent (that of Japan), the steam tonnage of France has increased but 7.3 per cent. The tonnage of sailing vessels of these nations has invariably decreased, except that of France, which has increased 5.4 per cent. This increase was due to the large bounties which are given to owners of sailing vessels, by virtue of the law which is now in force.

GOVERNMENT POLICY.

In 1865, the sensible decline of the French merchant navy engaged the attention of the public powers. Until 1866, the régime of the tax upon the flag (surtaxe de pavillon) had been in force. The commercial treaties, however, which had been ratified by the French Government a short time before, rendered this tax inapplicable. In 1872, the Government again endeavored to protect its merchant navy by taxing the ships of foreign countries bringing merchandise into French ports. In June, 1873, owing to threats of reprisals by the foreign governments interested, the law was repealed.

In 1873 and 1874, a profound study was made of the condition of maritime affairs, and in 1881 the Parliament passed a law granting bounties to owners and builders of merchant vessels. This law was to have been in operation for ten years; but at the end of this period it was continued in force for two years longer. In 1893, the present law was enacted. The details of these laws were given in the annual report of this consulate for 1896, and published in Commercial Relations, 1896–97, Vol. II, pp. 229–231. By the provisions of the law of 1881, the shipbuilder was allowed a bounty of $11.58 for every gross ton of vessels constructed, and $2.32 per 100 kilograms (220 pounds) of machinery and boilers. To the owner of ships of French construction, a bounty of 29 cents per net ton for every 1,000 miles sailed for the first year was given. After the first year and for every succeeding year during which the law was in operation, the bounty was diminished 1.4 cents for wood and composite vessels and 1 cent for vessels built of iron or steel. The bounty for ships constructed in foreign shipyards and flying the French flag was reduced one-half.

The law of 1893 differs from that of 1881 in the following particulars:

(1) The bounty for construction was increased from $11.58 to $12.54½ per gross ton, and from $2.32 to $2.89½ per 220 pounds for machinery and boilers.

(2) The half bounty allowed to owners of foreign-built ships registered under the French flag was entirely suppressed. Those

vessels, however, which were registered before the promulgation of the present law continue to receive the half bounty under the provision of the law of 1881.

(3) The bounty given to shipowners is based upon the gross tonnage, instead of the net tonnage; but the amount of bounty allowed to steamers was reduced from 28.95 cents to 21.23 cents, and the annual decrease to 0.772 cent.

(4) The bounty for sailing ships was increased from 28.95 cents to 32.81 cents, the annual decrease being 1.158 cents.

(5) Vessels engaged in international coasting trade in European waters are allowed two-thirds of the bounty given to vessels in the over-sea trade.

(6) The extra navigation bounty allowed to ships constructed under plans approved by the Navy Department was increased from 15 to 25 per cent.

It will be interesting at this point to show what have been the results of the law which is now in force.

In the table showing the increase of steam tonnage of several of the larger maritime nations, it was seen that the increase for France from 1893 to 1898 was 66,961 tons gross. This augmentation of the steam merchant navy was composed as follows:

Description.	Number.	Gross tons.
Increase:		
Steamers of less than 1,000 tons	46	12,941
Subsidized steamers	6	32,219
Steamers engaged in trade reserved to French vessels only	10	22,043
Gain	62	67,203
Decrease (steamers engaged in foreign competition)	4	242
Net gain	58	66,961

Thus, the steam tonnage, which showed an increase during the five years, was limited to vessels belonging to subsidized lines or those engaged in navigation reserved entirely to French vessels, the fisheries, French coasting and Algerian trade, or, in other words, steamers which received no benefits from the bounty law of 1893; while the steam tonnage engaged in meeting foreign competition actually showed a decrease.

The gross tonnage of vessels taking part in foreign competition in 1880 was 322,000 tons, not including subsidized postal steamers. Under the law of 1881, this tonnage was increased to 501,000 in 1885, an augmentation of 180,000 tons, or nearly 56 per cent.

The law of 1893 does not appear to affect the shipbuilders more favorably than the shipowners. In addition to sailing ships and steamers for subsidized lines, the French shipyards built the following merchant steamers:

	Gross tons.
1893	8,891
1894	4,448
1895	7,382
1896	4,662
1897	5,200
Total	30,583

This shows an annual average of 6,116 tons. Under the law of 1881, the conditions were as follows:

	Gross tons.
1880 (before law was passed)	3,068
1881	9,412
1882	16,980
1883	23,285
1884	28,058
Total	77,735

This shows an annual average for the four years of 19,434 tons.

In 1882, 1883, and 1884, the first three years after the law of 1881 went into force, there were built in the shipyards of France 151,270 gross tons of steel and iron vessels, and machinery, boilers, etc., weighing 54,032,000 pounds; an annual average of 50,423 tons of vessels and 18,011,400 pounds of machines and boilers. During the years 1894, 1895, and 1896, there were built 76,650 tons of steel and iron vessels, and machines and boilers weighing 4,402,400 pounds; an annual average of 25,880 tons of vessels and 14,667,400 pounds of engines and boilers.

It has been shown that the support given to the steam fleet of France by means of the bounties granted by the law of 1893 has not developed that branch of the merchant navy to the extent hoped by the projectors of the law; the sailing fleet, however, owing to the large bounties given to sailing vessels of French construction by the provisions of the above law, has increased more in proportion during the last five years than the sailing fleet of almost any other nation. The net sail tonnage of France of vessels measuring over 100 tons in 1893 was 196,224 tons; in 1898, it was 206,898 tons—an increase of 5.4 per cent. In the French shipyards, there were constructed from 1894 to 1897, inclusive, 31 sailing vessels of more than 1,000 tons, measuring together 73,953 gross tons. According to the statistics furnished by Lloyd's Register on October 1, 1898, there were being constructed in these same yards 14 sailing vessels measuring 25,302 gross tons; while in Germany there were 150 tons, in England 2,693 tons, and in Italy 2,684 tons. On the same date, 143,000 tons of merchant steam vessels were being built in Germany.

The following table gives the number and tonnage of vessels over 100 tons, excluding war ships, under construction in June, 1899, in the private shipyards of France, according to the latest returns received at the office of Lloyd's Register:

Place.	Steamers.		Sailing vessels.		Total.	
	Number.	Gross tonnage.	Number.	Gross tonnage.	Number.	Gross tonnage.
Bordeaux	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
Dunkirk	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
Havre and Rouen	2	5,958	16	40,228	18	46,186
La Ciotat	3	14,300	Nil.	Nil.	3	14,300
La Seyne	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
St. Nazaire and Nantes	7	24,650	12	26,005	19	50,655
Total	12	44,908	28	66,233	40	111,241

According to the same authority, at the same date there were in course of construction in Great Britain 1,382,885 tons of steamers and 3,482 tons of sailing vessels; in Germany, 198,770 tons of steamers and 1,520 tons of sailing vessels; and in Italy, 68,128 tons of steamers and 4,450 tons of sailing vessels.

A sailing fleet is not the proper means of meeting the active competition which exists at the present time between maritime nations in the struggle to secure the transportation of merchandise over the seas.

There are probably no finer sailing ships afloat than those of the *Félix Faure* and *Emile Renouf* class: built of steel, of 3,500 tons burden, beautiful lines, great carrying capacity, and having the latest improvements; but their trade must necessarily be confined to carrying heavy merchandise of low value and to long distances. Sailing ships may also be good schools for graduating efficient sailors; but even this advantage is not as important to the navy of the country as in days gone by, as the modern vessels of war are so intricate that skillful engineers, machinists, and electricians are more in demand than sailors.

It is evident that the law of 1893, enacted for the purpose of improving the efficiency of the French merchant marine, has not accomplished its purpose. Many protests have been made against the workings of this law, and demands have been heard that the law be either repealed or that it be materially changed. The shipowners ask that the half bounty formerly allowed to vessels of foreign construction and registered under the French flag be restored. The question arises, Why should French shipowners desire to purchase their vessels in foreign countries, especially in England? This question is answered as follows in the report of the committee on the budget of the Minister of Commerce for 1899:

> This preference has several causes. The English shipbuilder is able to obtain his iron, coal, machinery, and labor at a better price than ours. Besides, an English shipyard will deliver a vessel in nine months which would take twenty and even thirty months in a French shipyard. The French yards being almost entirely absorbed by orders for naval vessels, both from the French and from foreign governments, are fatally led to make demands from private sources wait. Cheapness and quick delivery have decided our owners to buy their ships in foreign markets.

WAR VESSELS.

The Minister of Marine, in his budget of expenses for 1899, gives the following list of new vessels which were being constructed for the Government in private French shipyards on January 1, 1899, or for which orders would be placed during the year:

At the shipyards of La Société de la Gironde, Bordeaux, 1 armored cruiser of 7,700 tons, 1 station cruiser of second class of 4,065 tons, 1 station cruiser of third class of 2,452 tons, and 6 torpedo boats.

At the Forges et Chantiers de la Mediterranée, at La Seyne and Havre, 1 armored cruiser of 9,517 tons, 1 armored cruiser of 8,114 tons, 1 station cruiser of first class of 8,017 tons, 6 torpedo boats, and 2 torpedo destroyers.

At the Société de la Loire, St. Nazaire, 1 armored cruiser of 7,700 tons, 1 station cruiser of the first class of 8,277 tons, 2 torpedo destroyers, and 5 torpedo boats.

At Châlons-sur-Saône, 5 torpedo boats and 5 torpedo launches.

At the establishment of Augustin Normand, at Havre, 11 torpedo boats.

Orders were still to be placed for 2 armored cruisers of 10,014 tons each, 1 cruiser of 4,000 tons, 2 torpedo destroyers, and 15 torpedo boats; making a grand total of war vessels either being constructed or to be built for the French navy in private shipyards of 6 armored cruisers, 3 cruisers of the first class, 1 of the second class, 1 of the third class, 6 torpedo destroyers, and 54 torpedo boats and launches measuring 87,909 tons displacement.

MEASURES TO IMPROVE MERCHANT MARINE.

In order to study the best methods to be adopted for the upbuilding of the French merchant navy and to discover the apparent defects of the laws of 1881 and 1893, in December, 1896, the Chamber of Deputies passed a resolution requesting the Minister of Commerce to appoint an extra-Parliamentary commission* for the purpose of hearing everyone interested in maritime affairs, report upon the changes which should be made in the present law, and recommend any new methods.

---

*See annual report of this consulate in Commercial Relations for 1898, Vol. II, pp. 203, 204.

The committee was composed of statesmen, shipowners, shipbuilders, managers of large steamship lines, men of all shades of political opinion, and thus admirably constituted to present an unbiased report.

Circulars were sent to the various chambers of commerce, maritime organizations, ship owners and builders, and to everyone who might be interested in the subject under consideration, stating that a committee had been formed and would hold meetings for the purpose of discussing all questions which might be of service in the formation of a plan for the amelioration of the merchant navy of France.

The committee was in session for nearly two years. Vast stores of valuable information were gathered from the papers presented and from the discussions which followed in the meetings, and after almost herculean labors in digesting the matter received, the committee in December last made its report.* The remedies proposed by the committee have been embodied in a bill which has been presented to the Chamber of Deputies by the Minister of Commerce for discussion and action during the coming session.

The recommendations of the extra-Parliamentary committee were as follows:

ARTICLE 1. Article 5 of the law of January 30, 1893, is modified as follows:

As a compensation for the charges imposed upon merchant vessels, by making them practically schools for seamen, who at any and all times up to the age of 45 years, or those who have not performed twenty-five years of service, can be drafted into the national navy, a shipping bounty (compensation d'armement) will be paid to all iron or steel seagoing vessels sailing under the French flag of more than 100 tons gross register and which are less than twenty years old.

The shipping bounty for steamers is fixed as follows (per day when they are in commission and per gross registered ton): For each ton up to 2,000 tons, 5 centimes (0.965 cent); for each ton above 2,000 up to 3,000 tons, 4 centimes (0.772 cent); for each ton above 3,000 up to 4,000 tons, 3 centimes (0.579 cent); for each ton above 4,000 tons, 2 centimes (0.386 cent).

The shipping bounty for sailing ships is fixed per day the vessels are in commission and per gross registered ton at half that allowed to steamers.

With the exceptions enumerated hereafter in the fourth article, the shipping bounty will be paid to all vessels registered before the expiration of the present law, until they are twenty years old.

ART. 2. Article 6 of the law of January 30, 1893, is modified as follows:

In order to develop the maritime industries of France, as a compensation for the charges imposed upon the merchant navy and for the excessive cost of vessels built in France, a navigation bounty (prime de navigation) will be paid to all steel or iron seagoing vessels, sailing under the French flag, constructed in France, measuring over 100 gross tons and less than fifteen years old.

---

* The details of the recommendations of the extra-Parliamentary committee were the subject of a special report from this consulate, published in Consular Reports No. 223 (April, 1899), p. 604, and Advance Sheets of Consular Reports No. 350 (February 14, 1899).

This bounty is fixed as follows: Per 1,000 miles sailed and by gross ton, calculated conformably to articles 1 to 12 of the decree of May 24, 1873, and article 1 of the decree of March 7, 1889:

(*a*) For steamers, the bounty will be 1.70 francs (32.81 cents) for the first year, with an annual decrease commencing with the date of registration of the vessel of 4 centimes (0.772 cent) for the first period of five years, of 8 centimes (1.544 cents) during the second period of five years, and of 16 centimes (3.088 cents) during the third and last period of five years. In any case, for vessels measuring more than 4,000 gross tons, the bounty will be decreased the first year 1 centime (0.193 cent) per 100 tons or fraction of 100 tons above 4,000 tons, provided the initial sum will not fall below 1.50 francs (28.95 cents).

(*b*) For sailing ships, the bounty will be 1.70 francs (32.81 cents) for the first year, with an annual decrease of 6 centimes (1.15 cents), commencing with the date of the registration of the vessel.

With the exceptions enumerated hereafter in article 4, the bounty will be paid during fifteen years from the registration of the vessel to all ships constructed in France during the period of the present law.

The two bounties are not cumulative; the highest will only be paid.

ART. 3. Ships engaged in the international coasting trade will receive the same shipping bounty (compensation d'armement) as over-sea vessels. They will only receive two-thirds of the navigation bounty (prime de navigation) allowed to over-sea vessels, to be calculated as described in the article above. Ships which in the same voyage engage in international trade, and also in coasting trade between a French Mediterranean port and a French ocean port, a French English Channel port or a French port in the North Sea, or inversely, are entitled to the shipping bounty and navigation bounty for the time occupied, or the number of miles sailed when the ships are actually engaged in international trade; provided that the total amount of merchandise taken in or discharged by them in foreign ports during the said voyage amounts to at least one-third of their net tonnage.

Over-sea vessels, in going or returning, which may call at Port Said, are entitled to the bounties for the distance they may have sailed.

ART. 4. Are excepted from all participation in the two bounties:

(*a*) Ships which obtain their French register after they are ten years old.

(*b*) Ships engaged in deep-sea and coast fishing, vessels subsidized by the Government, and yachts.

(*c*) Ships which are engaged exclusively in traffic reserved to French vessels only; also those which ply between French and foreign ports which are situated less than 120 miles apart.

(*d*) Ships engaged in traffic reserved to French vessels only, which call at foreign ports without discharging or taking on merchandise amounting to at least one-third of their net tonnage.

ART. 5. Articles 5 and 6 of the present law, without change, will remain applicable for the duration of the law, to all vessels, whether of wood, iron, or steel, the owners of which claim the benefits of the said articles.

ART. 6. The law of January 30, 1893, modified by the changes above mentioned, will be continued in force for a period of twenty years, commencing from the date of the act which will make these modifications a part of the law.

The most important addition to the law of 1893 recommended is that contained in article 1. This article was adopted only after much discussion. It served as a compromise between the great majority of shipowners, who demanded that the half bounty formerly allowed under the law of 1881 to vessels of foreign construction should be restored, and the shipbuilders, who strenuously opposed any favors being shown to vessels other than those constructed in the home yards.

In addition to the extra-Parliamentary committee appointed by the Minister of Commerce, a similar committee was selected by the Minister of the Marine, which worked along parallel lines. The committee in its report recommended as follows:

(1) To allow the half bounty to French vessels of foreign construction, which was suppressed by the present law of 1893.

(2) To increase the bounty allowed to steamers of French construction from 21.23 cents to 32.81 cents per gross ton, the same as that now given to sailing vessels.

(3) To not only increase the bounty to steamers of French build to 32.81 cents per gross ton, but to give the half bounty to all vessels flying the French flag constructed in foreign yards on this basis—that is, 16.4 cents per gross ton.

It would be practically impossible to give in the compass of this report more than a mere résumé of the methods which have been proposed to increase the efficiency of the French merchant navy. For the benefit of those who wish to seriously study the grave problem which has presented itself to the French people and to examine in detail the various remedies offered other than those suggested by the two committees, I am forwarding to the Department as an annex to this report a valuable work by Henri Estier,* a member of the extra-Parliamentary committee and one of the ablest economists in France. It contains many facts and statistics taken from official and other sources; also analyses of the most important of the measures brought before the committee.

MATERIALS FOR SHIPBUILDING.

The principal materials for shipbuilding—plates and structural forms for steel and iron vessels—are produced in France. Owing to the great demand existing at present for armor plate, steel rails, bridge construction, etc., the metallurgists can not make prompt deliveries. For this reason and on account of the cheapness of certain classes of foreign shipbuilding material, the French constructer is obliged to import considerable quantities from abroad, principally from England.

Almost all the wood entering into the construction of vessels in this country is imported.

---

*Transmitted to the Commissioner of Navigation.

On August 1 last, the current market price of steel plates was 30 francs ($5.79) per 100 kilograms (220 pounds), or about $58 per ton. The prices have an upward tendency.

WAGES.

The average wages paid to the workmen in the private shipyards of the Department of La Seine Inférieure are as follows:

Workmen.	Per hour.	Workmen.	Per hour.
	Cents.		*Cents.*
Pattern makers	17.37	Ship carpenters	14.48
Riveters	13.51 to 15.44	Furnace men	17.37
Joiners	11.58	Painters	11.58 to 15.44
Sheet-iron workers	13.51	Riggers	15.44 to 17.37
Machinists	11.58 to 12.55	Laborers	8.69 to 10.52

In the following table are given the average monthly wages paid in the port of Havre to the crews of deep-sea vessels belonging to the nations whose flags are the most often seen in this harbor:

Class.	Great Britain.	France.	Norway and Sweden.	Italy.		Germany.
				Steam.	Sail.	
Seamen	$14.60	*$11.58 †12.55	$13.40	$12.55	$13.51	$13.09
Boatswains	$17.03 to 21.90	23.16	17.42	19.30	17.37	....
Carpenters	19.47 to 24.33	17.37	17.42	17.37	....	....
Quartermasters	19.47	....	....	....	....	....
First mates	29.20 to 38.93	$57.90 to 67.55	20.10	38.60	23.16	....
Second mates	24.33 to 29.20	38.60 to 48.25	16.08	28.95	....	....
Firemen	21.90 to 24.33	15.44 to 19.30	14.74	19.30	....	16.66
Coal passers	18.25 to 19.47	11.58 to 13.51	13.40	10.62	....	11.90
Oilers	15.81 to 19.47	19.30 to 23.16	....	9.65	....	....
First engineers	77.86 to 97.33	77.20 to 86.85	58.96	77.20	....	....
Second engineers	48.67 to 73.00	48.25 to 67.55	32.16	48.25	....	....
Third engineers	34.06 to 38.93	28.95 to 38.60	....	....	....	15.23
Cooks	....	....	16.08	15.44	....	....

*Sail. †Steam.

The above information, with the exception of that relating to French seamen, was furnished by the consular representatives of the countries mentioned. It was obtained directly from the articles of vessels which have discharged and shipped crews in Havre. The average wages paid to French crews was given by the shipping commissioner at this port.

I have been unable to obtain from official sources the exact average cost for maintenance of the men on vessels of the different nationalities; but from what I can gather unofficially, it can be said that on Norwegian and Swedish vessels the cost is 25 cents per day, on German vessels 36 cents per day, on English vessels from 25 to 35 cents per day, and on Italian vessels 22 cents per day. In France, the law requires that owners of vessels of that country shall feed their men as well as those serving on board men-of-war. The minimum cost of a navy ration is 23 cents. If the merchant sailors are furnished with food inferior in quality to that given to men-of-war's men, they have a right to file a complaint before the French shipping commissioners. As the food which is provided for the navy is bought by contract and at the very lowest prices, it may be safely assumed that it costs to feed a French merchant sailor from 30 to 40 cents per day.

SUBSIDIZED LINES.

France pays annually to its subsidized postal lines about 26,000,000 francs ($5,018,000). These lines are as follows:

Havre to New York, the Antilles, and Mexico.

Algeria, Tunis, and Morocco.

Corsica.

Piræus, Constantinople, Beirut, Alexandria.

East coast of Africa and Indian Ocean, China, Japan, Australia, New Caledonia, Brazil, and La Plata.

West coast of Africa.

Havre to New York.—The postal service between Havre and New York was conceded for the first time to La Compagnie Générale Transatlantique for a period of twenty years, in execution of the law of June 17, 1857, by the agreement of April 24, 1861. The same agreement awarded to the above company the postal service with the Antilles and Mexico.

The annual subvention was fixed at 9,300,000 francs ($1,794,900), of which 3,000,000 francs ($579,000) were allotted for twenty-six voyages per year between Havre and New York, or 55.83 francs ($10.77) per maritime league, for a speed of 11½ knots per hour.

An additional agreement on December 16, 1873, increased the number of voyages per year to forty and the subsidy to 3,644,000 francs ($703,292), making the rate per marine league 44.08 francs ($8.51).

Two years before the expiration of the first concession, the Government, by the law of June 24, 1883, was authorized to ask for bids for the postal service between France and the United States and between France and the Antilles and Mexico. The successful bidder in each case was the Compagnie Générale Transatlantique. The contract was awarded for a period of fifteen years, commencing July 22, 1886, and ending July 21, 1901.

The service with New York became a weekly one; the annual average minimum speed was increased to 15 knots and the subsidy to 5,480,000 francs ($1,057,640), making the rate per marine league 49.60 francs ($9.57).

To encourage the company to construct larger and faster ships, a speed bounty was also granted by the law of June 24, 1883, amounting to 12 francs ($2.32) per gross ton, and per one-tenth of a knot above 15 knots with a maximum of 1,200,000 francs ($231,600) per year. Since 1892, the company has been earning the maximum subsidy, making the annual rate per marine league, speed bounty included, 67.407 francs ($11.66).

The French company realizing, with vessels like the *Bretagne*, *Champagne*, and *Gascogne*, or even the *Touraine*, that it was unable to meet the competition of the fine ships belonging to rival lines, asked the Government to extend for ten years the duration of its present agreement, so that it could construct two new fast steamers.

In 1898, a new agreement* was entered into between the Government and the company, by which the present concession, which terminates July 21, 1901, was extended for ten years until July 21, 1911. The company binds itself to construct in France three, and eventually four, new steamers for the service between New York and Havre, which shall combine all the latest improvements as to equipment and comfort. These steamers shall develop on their trials, for a period of three hours, a minimum speed of 22 knots under forced draft. The first three ships shall be ready for service on April 1, 1900, July 1, 1900, and April 1, 1903, respectively. If on July 1, 1905, it be found that the new steamers have attained an annual average speed 10 per cent less than that of the steamers of competing lines, the French company agrees to build another steamer, to be completed not later than April 1, 1908, on condition that the port of Havre is, in the meantime, improved so as to accomodate a steamer of at least 623 feet in length. The Government may exact for the fourth vessel every improvement compatible with advanced ocean traffic at that period.

The minimum annual average speed under the new agreement shall be from April 1, 1900, 17 knots; from July 1, 1900, 17.5 knots; from April 1, 1903, 18.3 knots; from the putting into commission of the fourth steamer, if necessary, 19 knots. When the annual average speed shall exceed the foregoing figures, the company shall be entitled to a speed bounty of $4.82 per one-tenth of a knot per gross ton from the date when the first vessel shall enter into commission. If the speed agreed upon is not reached, the same rate can be exacted by the Government for every one-tenth of a knot decrease. The total amount of the present annual subvention, 5,480,000 francs ($1,057,640), and the annual speed bounty, 1,200,000 francs ($231,600), can not be exceeded up to July 21, 1901.

---

*See report upon subsidies of the French line of steamers, published in Consular Reports No. 217 (October, 1898), pp. 209-213; Advance Sheets of Consular Reports No. 201 (August 24, 1898).

From July 22, 1901, to July 21, 1911, the amount of the subvention will be reduced to 5,000,000 francs ($965,000) and the maximum speed bounty raised to 1,680,000 francs ($324,240).

Algeria, Tunis, and Morocco.—By the agreement of December 16, 1896, the subsidized postal service between France and Algeria, Tunis, and Morocco, is shared by three steamship companies—La Compagnie Générale Transatlantique, La Compagnie de Navigation Mixte, and La Société Générale de Transports à Vapeur. The amount of subsidy granted is 1,600,000 francs ($308,800) per year, and the maximum speed bounty is 400,000 francs ($77,200). The total amount paid in 1898 for subsidy and speed bounties was 1,692,655 francs ($326,682).

Corsica.—Under a provisional arrangement, the subsidized postal service between France and the Island of Corsica is carried on by the Compagnie Générale Transatlantique and the Compagnie Fraissenet. The amount of subsidy paid yearly can not exceed 355,000 francs ($68,515).

Indo-China, Japan, Australia, New Caledonia, east coast of Africa, Brazil, and La Plata.—The present postal service between French Mediterranean ports and these countries is performed by the Messageries Maritimes. In 1898, for the lines running between Marseilles and Indo-China, China, and Japan, and the branch lines between Colombo and various Indian ports, and between Singapore and Batavia, the amount of subsidy paid was 6,085,032 francs ($1,174,411), the rate per marine league 31 francs ($6.98), and the annual speed 13 knots on the main lines and 11.5 knots on the branch lines. Between Marseilles, Australia, and New Caledonia, the subsidy paid in 1898 amounted to 3,107,936 francs ($599,832), the rate per marine league 31 francs ($6.98), and the average speed 14 knots. Between Marseilles and the east coast of Africa and the Indian Ocean, the amount of subsidy was 1,924,640 francs ($371,456), the average per marine league 20 francs ($3.86), and the average annual speed 12 knots.

Greece, Turkey, Asia Minor, and Egypt.—Between Marseilles and Greece, Turkey, Asia Minor, and Egypt, the bounty paid was 1,351,666 francs ($260,872), the average per marine league 13.625 francs ($2.63), and the average speed 13 knots.

West coast of Africa.—The subsidized postal service between Havre and the west coast of Africa is maintained by the Chargeurs Réunis, and between Marseilles and the same coast by the Compagnie Fraissenet. The increase of the traffic on the latter line was so great that commencing July 15, 1891, the Compagnie Fraissenet doubled its service without receiving any extra subsidy from the Government. A short time after, the Chargeurs Réunis followed the same example. The Compagnie Mixte has a regular monthly service for which it receives no subsidy. The amount of subsidy paid in 1898 for this service was 500,850 francs ($96,664), the annual average speed 9 knots.

Calais–Dover.—Between Calais and Dover the subsidy paid annually to the Northern Railway of France is 250,000 francs ($48,250), and the average annual speed required, 15 knots.

VALUE OF AUXILIARY CRUISERS.

When the renewal of the concessions for postal service between Havre and New York was being considered in the Chamber of Deputies, the question of what is the true rôle of postal steamers as auxiliary cruisers in time of war was ardently discussed. Mr. Raiberti, the deputy from Nice, demanded that the speed of the new postal steamers should be at least 23 to 25 knots. He defined the rôle of an auxiliary cruiser "to force a blockade, to carry dispatches, to establish rapid communication between the metropolis and the colonies, to transport troops, to revictual the ports, to serve as scout boats for the naval fleets, to privateer against an enemy's commerce, and to fight the enemy's auxiliary cruisers." Mr. Charles Roux, former deputy from Marseilles, who took a prominent part in the debate upon the French merchant navy, says in his book:

> We must not place too much confidence in the fighting qualities of mail steamers armed as auxiliary cruisers. However excellent a cruiser of this kind may be, it would not take five minutes for the most ordinary battle ship or armored cruiser, with a well-directed shot, either to sink her or to place her in a disabled state that would surely lead to her capture.
>
> Speed can only serve a vessel to escape as rapidly as possible from the enemy's battle ships or protected cruisers, as soon as they are discovered; but for this purpose it is not necessary to have a speed of 25 knots, and I do not hesitate to assert that the increased dimensions which such a speed would require would only be a drawback to the real service which the auxiliary cruisers are called upon to render.
>
> We admit that the auxiliary cruisers can be used in the movement of troops, but we firmly hope that a minister of the navy would never dare to embark 1,200 to 1,500 men on a vessel of this class to transport them to some distant point, leaving the ship to protect itself with its own armament in case of attack. He would have her convoyed; he would surround her with war vessels which would be ready to defend her in case of need. To act otherwise would be an imprudent folly. As to the revictualing of ports, for this purpose it would be necessary for the cruisers to enter the ports. But we would like to know where is the harbor where a vessel 200 to 215 meters (656 to 705 feet) long could enter. We see Brest and Cherbourg in the Atlantic; Toulon and Marseilles in the Mediterranean; we know no others.

This would be a grave inconvenience, for these vessels should not only be able to revictual the greatest possible number of ports, but they should be able to replenish their own supplies and to refit.

It must be remarked also that the cruisers which Mr. Raiberti would desire to have would be able to find dry docks of suitable dimensions only in the naval ports—that is to say, the points of our coast which would naturally be the most watched by the enemy and the most difficult to enter.

We now arrive at the question of privateering against the enemy's commercial ships. In our opinion, this is when the auxiliary cruiser would be most efficacious. We know well that privateering has been abolished by the treaty of Paris; but if fate wills that we should engage in war with a maritime nation, notably with England, whose superiority is overwhelming, it is certain that we would have no other means of fighting and of hastening the end of hostilities than by doing all the damage possible to its commerce.

To render efficient the rôle of our auxiliary cruisers—and it is no less indispensable for them as it is for our war fleets—it is necessary to establish coaling and refitting stations.

The naval committee of the Chamber of Deputies, in accord with the budget committee and its distinguished chairman, Mr. de Kerjegu, have rendered a veritable service to the country in forcing the Government, in view of completing the programme of recuperating our naval forces, to create new points of support and to ameliorate those already existing.

If this truth were in need of demonstration, the American-Spanish war would furnish the most convincing arguments. Messrs. Lockroy and de Mahy were perfectly right in declaring as urgent the amelioration and the establishment of naval stations in the metropolis and in our extra-European possessions, in Tunis, Algeria, Saigon, Madagascar, Dakar, Gorée, and Martinique.

The greater the speed, the greater the amount of coal burned, and the more the necessity of securing it en route. The greater the speed, the greater the chances of damages to the cruiser, and the more the necessity of finding suitable dry docks and repair shops.

To neglect the strategic positions, the admirable points of support which are offered to us in our possessions beyond the seas, in the Atlantic and Indian oceans, would be to accept in advance not only the loss of those possessions, but in case of war with England to give to that country all the chances against us in assuring safety to her commerce and food supply, and in doing away on our part with all blows which might be struck against her colonial possessions.

It will be seen how complex is the question of utilizing the mail steamers in the event of a maritime conflict, and how imprudent and deceptive it would be to think that the problem could be solved by sacrificing to speed alone all other conditions necessary to the practical requirements and good service expected of these vessels.

NEED OF A MERCHANT MARINE IN THE UNITED STATES.

The United States has acquired a mastery in the agricultural and mechanical industries. Yet to deliver the products of her farms and workshops to foreign customers, she has to depend to a great extent upon rival vessels. It is estimated that over $200,000,000 are paid annually for the transportation of American wares over the seas. Of this amount, less than 10 per cent is received by our own carriers. The time has come when a great nation like the United

States should check the stream which is flowing into the coffers of foreign competitors and turn it to the advantage of our shipbuilders and shipowners. This can be done by building up a merchant navy flying the American flag, which will give our exporters shipping facilities equal to the increasing volume of American trade.

A. M. THACKARA,
Consul.

HAVRE, *September 6, 1899.*

MARSEILLES.

LAWS ON THE MERCHANT MARINE OF FRANCE.

The relative importance of the merchant marine of France has declined since 1866, with exceptional intervals. In the French mind, legislation has been held responsible for the deplorable state of affairs existing, and legislation has been invoked to supply the remedy. In 1881, a brief period of revival succeeded the enactment of a law establishing premiums upon the mileage of all ships flying the French flag, the amount being doubled in the case of ships of French construction. In 1893, this premium was cut off in so far as it applied to ships built abroad, and the decline reasserted itself. In 1896, a Parliamentary commission was named to frame a new law which should arrest the alarming decadence of the merchant marine, and the report of that commission, it is confidently expected, will be written into law at the next session of the Assembly in October. The proposed measure reestablishes the principle of premiums to ships of foreign construction flying the French flag and provides other gratuities for a longer term of years and under conditions more favorable than the law of 1881.

CAUSES OF THE DECADENCE.

It is probably true that to an extent at least, the inferiority of the French merchant marine is attributable to the timidity or indifference of French capital when the conditions of navigation underwent revolution upon the introduction of steam. The greatness of French shipping goes back to the period when masters were merchants as well as sailors, and before modern collectivism had replaced individual enterprise. Under the new order of things, the consumer was brought into direct relations with the producer, thus reducing the midway ports of Europe to way stations, each securing its own proper business and such transshipments for the interior as its peculiar advantages attracted. In the new kind of competition, the British and Germans showed a willingness to equip regular lines of steamers, which found their way into French ports and threaten to-day to crowd out the home flag.

Other nations forged ahead until the average net tonnage of steamships passing through the Suez Canal had increased from 1,072 in 1872 to 2,511 in 1896. France meanwhile contented itself with smaller and older ships and inferior facilities for handling cargoes. Marseilles retained its actual, if not its relative, rank as one of the five great ports of the world, and even brought its docks and basins to a high state of perfection; but of France as a whole, it must be said that its resources were distributed among many small ports, while Germany, Italy, Austria, and Holland expended every energy to develop one or two ports which contained the natural elements of greatness. In Europe generally, railways were constructed, tunnels pierced, and canals dug, all with a view to increasing business; but in France this was not true. To quote the Marseilles Chamber of Commerce:

> We have relations with the Continent by a single route of communication—the Paris, Lyons, and Mediterranean Railway.

Complaining bitterly of limited facilities and burdensome tariffs for land transportation, the chamber continues:

> The Government at two different periods has proposed measures to relieve the intolerable situation that we describe, and yet twenty years have elapsed since the projected canal to the Rhone was first considered. We demand, in consequence, that the Minister of Commerce shall use his high authority to obtain a near and favorable solution of this problem.

Together with the difficulties already touched upon, there is dissatisfaction with the requirement that French ships shall be manned almost exclusively by French crews, while competing nations, especially the British, permit their shipowners to go into the labor market and employ sailors of all nationalities. While many of the great English corporations have found it profitable to hire on nominal terms the Lascar Indians, who to-day menace the prosperity of the British able seamen, the French masters can only ship their own countrymen; and it is frequently the case that French labor can not be obtained on any terms.

EXISTING ACTUAL AND RELATIVE IMPORTANCE.

Whatever be the causes, the French merchant marine has now fallen from second to third place among European nations,* and sees other nations still behind closing up the gap from year to year. The following table, showing the gross tonnage of the merchant marines of the important commercial nations of Europe at different times, puts the whole situation in a nutshell:

---

* See "Shipping of the world," p. 47 of this series.

Year.	France.	Great Britain.	Germany.	Sweden and Norway.	Spain.	Italy.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
1887	722,252	6,592,496	628,296	150,689	388,581	243,491
1888	752,028	6,873,552	662,331	160,568	395.685	276,326
1889	747.512	7.507,885	771.998	191,953	411,713	290,041
1890	805,983	8,043,872	930.754	245,052	423,627	294,705
1891	843,486	8.536,994	1,083,307	221,202	439.585	313,306
1892	835,045	8,912,522	1,091,472	339.147	438,113	317,532
1893	856,375	9.383,361	1,144,199	362,652	439,657	323.595
1894	872,103	9,706,976	1,216,092	406,119	465,273	319,049
1895	864,598	9,984,280	1,306,771	455.317	488,955	318 750
1896	933,224	10,245,277	1,360,472	494,612	519,315	344.523

On the 31st of December, 1896, the entire French commercial fleet, comprising sailing and steam ships, included 15,536 vessels, employing 81,233 sailors and 7,401 engineers and firemen.

The Marseilles Society for the Defense of Commerce, in an official report to the late Parliamentary commission, attributed the decadence of the French marine first and foremost to the competition of Great Britain and Germany, whose ships are built and equipped at lower cost than is possible in France. It says:

> Great Britain has coal and iron at lower prices than France, and with its innumerable shipyards and machine shops, can produce tonnage on terms with which our builders are incapable of competing. Not only are the ships supplied at lower cost, but they are supplied more promptly. Furthermore, Great Britain exports annually 30,000,000 tons of coal, and thus gives its outgoing ships a cargo, while with us we are less and less able to furnish an outgoing cargo, although the lowering of freight rates necessitates a constant increase of tonnage. After the British and Germans, the Norwegians occupy an important place in international transportation. The existence of their ships is due to the fact that Norway possesses a large maritime population which knows only the sea and is satisfied with low wages.* Thus, that nation exploits enterprises wholly out of proportion to the commerce of the ports to which they are attached.

EFFECTS OF THE LAW OF 1881.

The alarming decadence of the merchant marine between 1866 and 1881 led to the law of 1881, which accorded a subsidy to all ships engaged in international commerce carrying the French flag, whether built at home or abroad. This subsidy, or rather premium, was reduced 50 per cent for foreign-built vessels. From its promulgation, new navigation companies sprang into being, and in less than one year one hundred steamers, built in France and abroad, were added to the merchant fleet. The Society for the Defense of

---

* Note scale of wages paid to Scandinavian seamen at Marseilles consulate, p. 44 of this series.

Commerce declares that this law would have produced happy results had it not been limited to ten years. Doubting its renewal, shipowners ceased some years before its expiration to increase their floating stock. The law, by its terms, gave a premium of 1.50 francs (27 cents) per net ton measurement for every marine mile traveled in voyages exceeding 60 miles. This premium was but 75 centimes (13½ cents) for ships of foreign construction. An additional premium to French builders was also allowed, as follows: Per ton of gross measurement on iron or steel ships, 60 francs ($11.58); on wooden ships of more than 200 tons, 40 francs ($7.72); on wooden ships of less than 200 tons, 30 francs ($5.79); on motive machinery and auxiliary apparatus, 12 francs ($2.31) per 100 kilograms.

PRESENT FRENCH BOUNTY LAW.

The new law of 1893 cut off the premium to foreign-built ships and provided only for a premium on vessels of domestic construction, which premium was collectible during ten years only and by an annually decreasing scale. This law continued to favor French builders, and its more important features are here given:

TITLE II.—MARITIME CONSTRUCTION.

In compensation for the tariff charges imposed upon the builders of seagoing ships, the following allowances are made to them per ton:

For steam sailing ships in iron or steel, 65 francs ($12.54).

For wooden ships of 150 tons or more, 40 francs ($7.72).

For ships of wood of less than 150 tons, 30 francs ($5.79).

Premium to be paid upon the gross tonnage calculated according to articles 1 and 2 of the decree of May 24, 1873, and article 1 of the decree of March 7, 1889.

* * * * * * *

In compensation for the same charges, the following allowances are made to the builders of machines:

For motive-power machinery and its auxiliary apparatus, such as steam pumps, subsidiary motors, dynamos, windlasses, mechanical ventilators, placed on board steam or sailing vessels in a new state, also boilers and the necessary steam pipes, 15 francs ($2.89) per 100 kilograms (220 pounds).

The premium is accorded to machines and auxiliary apparatus put in place in a new state, and also on parts of machines which may be transformed or repaired during the existence of the ship.

As to the changing of boilers, the compensation is fixed at 15 francs per 100 kilograms (220 pounds) when the new boilers are of French construction.

TITLE III.—MARINE NAVIGATION.

By way of compensation for the burden imposed upon the merchant marine as an instrument for recruiting the military marine, there is accorded, after the promulgation of the present law, a premium upon navigation for all ships of French construction of more than 80 tons gross for sailing vessels and 100 tons gross for steam vessels.

This premium will be payable during ten years to all ships constructed in France during the life of the present law, the period to be calculated from the date of their registration.

The premium is payable exclusively to ships engaged in making long voyages (long cours) and in international coasting. Expressly excepted from receiving the premium are ships engaged in French coasting, fishing, lines subsidized by the State, and pleasure boats.

* * * * * * *

The premium payable to ships built abroad is suppressed. The premium conceded by the foregoing article is fixed by the gross tonnage calculated according to articles 1 and 12 of the decree of 1873, and to article 1 of the decree of March 7, 1889, per 1,000 miles covered for all ships of French construction.

The premium is fixed at 1.10 francs (21 cents) for steamships, with an annual decrease of 6 centimes (a fraction over 1 cent) for wooden ships; 4 centimes (not quite 1 cent) for iron and steel ships.

For sailing ships, the premium is fixed at 1.70 francs (32.8 cents), with an annual decrease of 8 centimes (almost 2 cents) for ships of wood, and 6 centimes (a fraction over 1 cent) for ships of iron or steel.

* * * * * * *

Ships engaged in international coasting trade will receive but two-thirds of the premium.

* * * * * * *

The premium is augmented 25 per cent for steamships constructed upon plans approved by the Department of Marine.

In the event of war, ships of commerce may be impressed by the State.

EFFECT OF EXISTING LAW ON MARINE CONSTRUCTION.

The law above quoted stands to-day, although its amendment is probable, as heretofore explained, in October. Its effect was to divide the interests of shipowners and shipbuilders. The former, at first disposed to give orders to domestic builders, found the latter constantly increasing their prices, until the point was reached where the builders were accused of calculating the amount of premium which proposed constructions would command and adding that amount to their own cost price, thus absorbing the premium for navigation and the one for construction. At this time, France has but three considerable shipbuilding companies. They are Les Forges et Chantiers de la Mediterranée, Les Ateliers de la Gironde, and Les Chantiers et Ateliers de la Loire. A fourth has just been organized and will be mentioned later. It is freely said that the three companies named are virtually agreed as to prices, and have now put them at prohibitive figures, meantime occupying themselves mainly with the building of war vessels.

Shipowners found that they could have new ships delivered from England in nine months, while the French yards required twenty. The Society for the Defense of Commerce says that the builders pretend that the difference between French and English prices is but 20 to 25 per cent; that this was true ten years ago, but is not now. "We could cite," it says, "a shipowner for whom one of our shipbuilders proposed to construct a vessel for 2,600,000 francs ($501,800), while English builders offered to build the same ship for 1,650,000 francs ($318,450)."

The society urges the passage of the proposed law, giving premiums to foreign-built ships. It argues:

> To buy foreign-built ships will be to pay to foreigners a tribute much less than the amount we now pay in freight. The freight charges, once paid, are lost forever, while the foreign-built ship diminishes in nothing the national wealth and gives employment to a numerous population.

Returning to the question of freight, without which there can be no merchant marine, the society declares that France is tied up by a railway monopoly, badly equipped for its mission and unchanged in its mileage between Marseilles and Avignon in forty-nine years.

GERMAN PROGRESS AS SEEN BY FRENCH EYES.

The Marquis d'Hericourt, consul-general of France at Leipzig, in an official report,* says:

> In 1896 Germany counted 330,805 freight cars; we had in France 287,486. The German cars had a capacity of 15,000 kilograms (33,069 pounds) each; ours had 10,000 kilograms (22,046 pounds). Germany had 16,107 locomotives; we had 9,747. German tariffs were one-twelfth less than ours. If Germany has organized with great care her lines of railway, she has given closer attention to her superb system of interior navigation. At the end of 1896, this represented 13,826.92 kilometers (8,592 miles), not including the 98 kilometers (61 miles) comprised in the Kiel Canal. The system is thus divided: Free rivers, 9,383.23 kilometers (5,831 miles); canalized rivers, 2,206.05 kilometers (1,371 miles); artificial canals, 2,237.64 kilometers (1,390 miles). The Germans have made navigable the great arteries leading to the sea. The results have responded to the hopes formed. Bremen has become a port of the first order and Hamburg the most frequented port of the world. Thanks to the development of interior water ways, raw materials are delivered on such terms that competition with foreigners has been made possible, and the merchant marine has prospered accordingly.

M. Bernard, president of the Compagnie Nantaise de Navigation, said to the Parliamentary commission:

> By the law of 1893, the French shipbuilders have not only gained an excessive protection—they have a monopoly. The truth is, our builders see in the building of ships of commerce a mere side profit. Their existence and their prosperity depend upon orders from the State. Their yards are first of all branches of the national arsenals. Five years ago, the shipowners in Germany were tributary to the English yards. To-day, the German builders execute as well and as quickly, and seek outside orders for less, at times, than those who were for years their masters. One can count to-day twenty-nine German shipyards which rival the greatest British yards, while our own yards, by common consent, are in a state of notorious inferiority. The Germans, first of all, created their material. They bought where best they could the ships they needed. Little by little, at first for the maintenance of their ships and then for their renewal, the German yards increased, and to-day produce shipping on conditions comparable with those of Great Britain.

---

*See "Dividends and tonnage of German companies," p. 49 of this series.

PORT DUES AND COMPLEX ADMINISTRATION.

Until comparatively recently, the French port dues,* being based upon the capacity of ships entering rather than upon the amount of business transacted, tended to keep out a number of foreign lines which now do an active trade, particularly in Marseilles. The change in regulations led to the arrival in these waters at regular intervals of the ships of half a dozen of the most important British lines, such as the Orient and the Peninsular and Oriental. Commenting upon this circumstance and some others, a member of the Marseilles Chamber of Commerce has written to me as follows:

> The French merchant marine is tied up in a network of regulations and obligations unknown to any other nation on earth. To enumerate these obligations would take too much time and space. It will do to state that the French merchant marine has to do with six different ministers, each of whom enforces his regulations and makes his demands. The shipowners are bending their efforts to unify the system and concentrate direction under one minister; but up to this time, they have not succeeded. It is these burdensome regulations which explain and justify the premiums and encouragements given to our marine, in part, and for the rest the explanation resides in causes foreign to ourselves and our laws.
>
> Aside from the premiums paid, the only advantage secured by the French merchant marine is that reaped in every land—that is to say, exclusive control of the coasting trade between French ports, including those of Algeria. Beyond this advantage, French ships are treated exactly like foreign ships. The rigidity of French administration permits of no distinction between flags, thanks to the vicious system which puts the ports in the hands of the State instead of placing them, as in England, in the hands of private companies or boards, with whom, as we know, only Englishmen can secure special accommodations. In the recent transformation of the law respecting quay rights, we have seen that the immediate effect was to open still wider our ports to foreign competition. We will not state here whether this has favored French commerce or not; but from the point of view of the French marine interest, we do say that direct competition has been stimulated.
>
> Our country has not even been able to maintain the monopoly of its flag in the coasting trade of its colonies. Quite recently, it has been obliged to abandon exclusive coasting privileges in Madagascar.
>
> The French chambers of commerce exercise no power over the merchant marine. They are only consulted with respect to it. In seaport cities, they manage certain maritime institutions, but all such are at the disposition of seamen of all nations.

NEW SHIPBUILDING ENTERPRISE.

Within recent months, the agitation on the subject of the merchant marine and the difficulty encountered in contracting for French-built ships at reasonable prices has led to the organization of a new shipbuilding enterprise at Port de Bouc, a small place situated a few miles west of Marseilles. The company is styled the Société des Chantiers et Ateliers de Provence. One of the gentlemen actively interested in the project writes to me:

> The new society has a capital of 7,000,000 francs ($1,351,000) and has been founded in order to enable French shipowners to secure the construction of their

---

*See p. 44 of this series.

vessels in France, a thing which at present is impossible because of the long delays of construction demanded by existing companies, which operate almost exclusively for State and foreign governments. The Chantiers et Ateliers de Provence have for their object to furnish facilities hitherto unavailable to French shipowners, and at the same time to draw profit from the premiums which the law of 1893 accords to our shipbuilders. The new society will be able to build vessels 200 meters (656 feet) long at Port de Bouc. Already, four ships have been ordered of our company, and they are nearly all to be 100 meters (328 feet) long, and of 4,000 tons measurement.

CONNECTION BETWEEN STATE AND FRENCH SHIPYARDS.

Commenting on the connection between the State and the French shipyards,* the Society for the Defense of Commerce inquires how the latter can pretend to undertake to renew the merchant fleet and make good its contract obligations to the State. It declares:

> Our yards can be utilized by the subsidized companies, but that is out of the question for the free merchant marine.

It is then said that, laying aside consideration of orders given prior to January 1, 1897, the new constructions to be made by or for the Government during the years between 1897 and 1903 will cost approximately 623,640,000 francs ($120,362,520), of which 297,205,000 francs ($57,360,515) will be expended in the arsenals and 326,435,000 francs ($63,002,005) in the industries.

PREMIUMS, BOUNTIES, AND SUBSIDIES.

The total amount paid out in recent years by the French Government in the form of premiums and postal subsidies is officially reported by the Minister of Commerce and Industry in the two tables following:

Table of bounties paid to navigation and construction since 1881.

Year.	Bounties to navigation—sailing vessels and steamships.				Bounties to construction.	
	Long voyages.		International coasting.			
	Francs.		*Francs.*		*Francs.*	
1881	2,980,895	$575,312.73	....	....	950,898	$183,523.31
1882	6,458,605	1,246,510.76	....	....	4,540,595	876,334.83
1883	8,465,291	1,633,801.26	....	....	3,160,297	609,937.32
1884	8,589,331	1,657,740.88	....	....	4,484,968	865,598.82
1885	7,567,280	1,460,485.04	....	....	1,129,151	217,921.89
1886	7,578,348	1,462,621.16	....	....	3,005,618	580,084.27
1887	8,213,482	1,585,202.02	....	....	1,457,482	281,294.02
1888	8,191,461	1,580,951.97	....	....	2,216,957	427,872.70
1889	8,486,530	1,637,900.29	....	....	3,054,503	589,519.07
1890	8,018,589	1,547,587.67	....	....	2,797,187	538,857.09
1891	7,362,626	1,420,988.81	....	....	2,800,917	540,576.98
1892	7,278,395	1,404,730.23	....	....	2,018,384	389,548.11
1893	6,808,542	1,314,048.60	1,111,940	$214,604.42	2,153,849	415,692.85
1894	6,495,374	1,253,607.18	1,390,905	268,444.66	2,089,301	403,235.09
1895	7,198,726	1,389,354.11	1,382,162	266,757.26	2,800,672	540,529.69
1896	8,131,482	1,569,376.02	1,443,248	278,546.86	4,106,348	792,525.16

---

* For amount of naval tonnage constructed, see p. 46 of this series.

Table of postal subsidies paid in France to navigation companies.

Year.	Distance.	Subsidies paid.	
	Miles.	*Francs.*	
1889	3,194,813	25,485,000	$4,918,605
1890	3,270,871	25,734,000	4,939,662
1891	3,270,871	25,734,000	4,939,662
1892	3,270,871	25,734,000	4,939,662
1893	3,348,092	26,271,000	5,070,303
1894	3,348,092	26,271,000	5,070,303
1895	....	26,183,000	5,053,319
1896	....	26,183,000	5,053,319
1897	....	26,183,000	5,053,319

The postal subsidies* are apportioned among several companies operating from Marseilles and the Compagnie Générale Transatlantique from Havre. The last-named company has a concession for a term that will end July 21, 1901, upon a mail route between France and New York, Mexico, and the Antilles. To encourage the building of large and rapid ships that could be used as auxiliary cruisers in case of war, the New York line subsidy was increased in 1886 to 5,480,000 francs ($1,057,640) per year, or 49.60 francs ($9.57) per marine league. The rate of premium was then fixed, in addition to the subsidy named, at 12 francs ($2.32) per ton of gross gauge, and by tenths of knots of acceleration of speed over 15 knots, with a maximum of 1,200,000 francs ($231,600) per year. This maximum has been attained since 1892, and the total subvention is therefore 60.40 francs ($11.66) per marine league. The original contract, which will expire in 1901, was in 1898 extended ten years, the condition being that the company should build four steamers of the latest design. The first of these ships should be delivered about April 1, 1900.

The service from Marseilles under the subsidy laws, chiefly provided by the immense Compagnie des Messageries Maritimes, is paid on the mileage basis. Thus, last year, the local companies received a total of 12,469,272 francs ($2,406,569) for 496,554 marine leagues, each equal to 6,075 feet to the marine mile. The following provides all other details:

Mediterranean service.—Rate, 13.02½ francs ($2.51) per league; distance covered, 103,774 leagues; speed, 13 knots.

Indo-Chinese service.—Rate, 31 francs ($5.98) per league; distance covered, 196,291 leagues; speed, 13, 13½, and 14 knots.

Australian and New Caledonian service.—Rate, 31 francs ($5.98) per league; distance covered, 100,256 leagues; speed, 14 knots.

West coast of Africa service.—Rate, 20 francs ($3.86) per league; distance covered, 96,232 leagues; speed, 12 knots.

---

*See "Postal subsidies paid by various nations," p. 45 of this series.

SUMMARY.

Summing up my observations and replying particularly to the questions contained in the Department circular of June 20, I have to say:

(1) The merchant marine of France is in an unsatisfactory condition; it follows that of England and Germany in relative importance.

(2) The Government pays postal subsidies, premiums on ships of French construction, and premiums on voyages made by French-built ships.

(3) The existing law dates from 1893, and agitation for its amendment is expected to prove fruitful within the next few months.

(4) War ships are built very extensively in France; but, instead of tending to lower the cost of merchant vessels, the work seems to have driven orders therefor to other countries, because of the high prices asked and delays in construction.

(5) Six Government departments have to do with the merchant marine of France, and the complexity of the existing order of affairs is one of the things most bitterly assailed by the marine interest.

(6) The only important official recommendation for the improvement of the marine is contained in an extra-Parliamentary report, likely to be adopted, as before explained. This report urges that premiums be paid to French vessels of foreign construction, the premium to be based upon their mileage. It is recognized that France can not build as cheaply as some other nations, and that the marine must be artificially aided. Present law recognizes the possibility of utilizing the subsidized mail steamers as cruisers in the event of war.

(7) All the commercial organizations of France discuss the merchant marine more or less and offer valuable suggestions. The difficulty is to harmonize the multitude of suggestions and get them crystallized into law.

(8) The iron and steel entering into French marine construction are of French origin. One of the partners in the most important repair company of Marseilles writes to me:

> Plates and structural steel armor, etc., are made in France by Schneider et Cie., of Creusot; Société des Fonderies, Forges et Acieries, St. Etienne; Compagnie des Hauts, Fourneaux, Forges et Acieries; St. Chaumond; Descours et Cie., of Lyons and Marseilles. The last-named firm, although strictly merchants, contracts for the entire product of several small manufacturers. The output in France is equal to or perhaps in excess of the demand. Oak, elm, beech, etc., are found in France, Pine, spruce, etc., come either from the Danube or the Baltic. Pitch pine comes from the United States.

(9) The current price for steel plates, angles, etc., delivered in Marseilles is about 24 francs ($4.63) per 100 kilograms (220 pounds).

(10) The average wage per day of mechanics or tradesmen is from 5 to 7 francs (96 cents to $1.35), depending more on individual merit than on the trade. The highest pay is obtained by ship carpenters and calkers, who are best organized. Common labor is paid from 3 to 3.50 francs (57 to 67 cents) per day. The French working-day is ten hours; overtime, one-half to twice the amount per day.

(11) The wages paid to sailors at this port appear in the tables following.

*Monthly wages paid by French shipping companies of Marseilles.**

Class.	Compagnie Nationale de Navigation (long voyage).		Cyp. Fabre Compagnie (long voyage).		Compagnie des Messageries Maritime (long and short voyage).	
	Francs.		*Francs.*		*Francs.*	
Captain	500	$96.50	400	$77.20	500	$96.50
Second captain (first mate)	300	57.90	200	38.60	200	38.60
Lieutenant	180	34.74	150	28.95	150	28.95
First engineer	400	77.20	400	77.20	300	57.90
Second engineer	250	48.25	200	38.60	150	28.95
Third engineer	200	38.60	150	28.95	....	....
Boatswain	120	23.16	110	21.23	90	17.37
Doctor	250	48.25	....	....	150	28.95
Carpenter	85	16.40	80	15.44	75	14.47
First fireman	120	23.16	110	21.23	95	18.33
Second fireman	85	16.40	85	16.40	90	17.37
Coal passer	75	14.47	....	....	75	14.47
Restaurateur	300	57.90	200	38.60	150	28.95
Steward	125	24.12	100	19.30	66	12.73
Second steward	120	23.16	80	15.44	....	....
First cook	150	28.95	125	24.12	100	19.30
Second cook	120	23.16	80	15.44	50	9.65
Third cook	....	....	....	....	50	9.65
Waiters	60	11.58	....	....	40	7.72
Butcher	110	21.23	....	....	....	....
Baker	110	21.23	100	19.30	....	....
Sailors	65	12.54	70	13.51	75	14.47
Sailors' novices	....	....	40	7.72	40	7.72

*Supplied by Commissaire de l'Inscription Maritime at Marseilles.

Monthly wages paid by French shipping companies of Marseilles—Continued.

Class.	Société Générale de Transports Maritime.		Compagnie Générale Transatlantique.			
			Short voyage.		Long voyage.	
	Francs.		*Francs.*		*Francs.*	
Captain	500	$96.50	400	$77.20	500	$96.50
Second captain (first mate)	300	57.90	200	38.60	250	48.25
Lieutenant	200	38.60	150	28.95	150	28.95
First engineer	400	77.20	350	67.55	350	67.55
Second engineer	275	53.07	200	38.60	200	38.60
Third engineer	200	38.60			200	38.60
Boatswain	100	19.30	100	19.30	125	24.12
Doctor	300	57.90			300	57.90
Carpenter	80	15.44			110	21.23
First fireman	100	19.30	100	19.30	100	19.30
Second fireman	85	16.40	85	16.40	85	16.40
Coal passer	70	13.51	65	12.54	70	13.51
Restaurateur	300	57.90			400	77.20
Steward					150	28.95
First cook	200	38.60	160	30.88	175	33.77
Second cook	135	26.05			150	28.95
Third cook	100	19.30				
Waiters					40	7.72
Butcher					100	19.30
Baker	120	23.16			100	19.30
Sailors	70	13.51	65	12.54	75	14.47
Sailors' novices					35	6.75
Purveyor					250	48.25
Femmes de chambre					40	7.72

The British consul, Mr. Martyn Cecil Turney, informs me that the following monthly wages represent the average paid to British seamen at the port of Marseilles:

Class.	Cargo boats from 1,500 to 2,000 tons.		Cargo boats from 800 to 1,500 tons.	
	£ s.		£ s.	
First mate	11 0	$53.53	8 0	$38.93
Second mate	8 0	38.93	6 0	29.19
Third mate	7 0	34.06		
First engineer	13 0	63.26	14 0	68.13
Second engineer	10 0	48.66	10 0	48.66
Third engineer	8 0	38.93	6 10	31.62
Steward			6 0	29.19
Cook	5 0	24.33	5 0	24.33
Boatswain	4 5	20.67	4 5	20.67
Fireman	3 15	18.24	3 10	17.02
Trimmer	3 0	14.59		
Able-bodied seamen	3 10	17.02	3 5	15.80
Carpenter	6 5	30.40		
Baker	5 0	24.33		
Donkey man	4 10	21.89	4 10	21.89
Mess-room boy			1 10	7.29

The vice-consul for Sweden and Norway at Marseilles, Mr. F. Westrup, advises me that seamen shipped at that consulate are paid per month about as follows:

Class.	Wages.	
	Crowns.	
Mate	70	$18.91
Boatswain	52	13.89
Carpenter	45	12.15
Able seamen	44	11.96
Ordinary seamen	36	9.65
Boy	30	8.10
Steward	52	13.89
Fireman	50	13.51
Coal trimmer	32	8.68

The officers of the German consulate-general have sent me the following schedule of average wages per month paid to German seamen at this port:

Class.	Wages.	
	Marks.	
First mate	150	$35.70
Second mate	100	23.80
Third mate	100	23.80
First engineer	375	89.25
Second engineer	220	52.36
Third engineer	140	33.32
Able seamen	60 to 70	$14.28 to 16.66
Carpenter	80	19.04
Cook	90	21.42
Fireman	70	16.66
Boatswain	75	17.85
First steward	60	14.28
Second steward	30 to 40	7.14 to 9.52

FRENCH PORT REGULATIONS.

ARTICLE 1. Vessels under flags, entirely or partially loaded, coming from foreign ports, or ports in French colonies other than Algeria, will pay quay dues in French or Algerian ports according to the following tariff:

One franc (19.3 cents) per net registered ton if the total number of net metrical tons (1,000 kilograms) of goods discharged or loaded is greater than half of the net registered tonnage of the vessel.

Fifty centimes (9.6 cents) per net registered ton if the total number of net metrical tons (1,000 kilograms) of goods discharged or loaded is equal to or less than the half of the net registered tonnage and exceeds the quarter of the said registered tonnage.

Twenty-five centimes (4.8 cents) per net registered ton if the total number of metrical tons of goods discharged or loaded is equal to or less than a quarter of the net registered tonnage and exceeds the tenth of said registered tonnage.

Ten centimes (1.9 cents) per net registered ton if the total number of metrical tons discharged or loaded equals or is less than the tenth of said registered tonnage.

These dues will be reduced by one-half in the case of vessels discharging goods when these vessels come from ports within the limits of "cabotage internationale" (international coasting) as defined in Article I of the act of the 30th of January, 1893 (*i. e.*, Franco-European trade, including African and Asiatic ports of the Mediterranean and Black seas). The conditions will be the same for vessels loading goods, when such vessels are bound to ports within said limits.

Vessels performing in the same port operations of discharging and loading will be charged separately for such inward and outward operations in accordance with the rates above indicated.

ART. 2. In the case of a steamer calling at successive ports, the quay dues at each port will accrue in accordance with the rules indicated in the first article; but in no case will the total amount of same, payable by a vessel on the same voyage, exceed 1 franc (19.3 cents) per ton on the net registered tonnage. These rates are reduced to 50 centimes (9.6 cents) on vessels complying with the conditions set forth in paragraph No. 6 of the preceding article.

ART. 3. In calculating the operations (of discharging and loading) for tonnage, each passenger landed or embarked will be considered as equivalent to 1 ton of goods. The same will be the case for each head of "large" cattle, horses, or mules. Each head of "small" cattle will equal one-fourth of a ton. Passengers' luggage, including their personal provisions for the voyage, will not be taken into account in the making up of the tonnage of the goods discharged or loaded.

ART. 4. The quay dues imposed in the preceding articles will, in Algerian ports, be collected only on goods, passengers, animals, and carriages discharged.

ART. 5. The taking in of stores, and bunkering, will not be considered as commercial operations—*i. e.*, will not alone incur payment of quay dues.

ART. 6. Are annulled: Article 6 of the act of January 30, 1872; Article 7 of the act (finance) of July 29, 1881; and the first paragraph of the act (finance) of December 28, 1875.

POSTAL SUBSIDIES.

Subsidies paid by various nations, as compiled by Henri Estier, member of the French extra-Parliamentary commission.

Itinerary.	Average obligatory speed.	Subsidy by marine league.	
France.	*Miles.*	*Francs.*	
Havre to New York	15	49.60	$9.57
St. Nazaire to Veracruz	11.5	30.811	5.94
Bordeaux to Buenos Ayres	14	17.806	3.43
Marseilles to Libreville	9	9.642	1.86
Havre to Libreville	9	10.70	2.06
Marseilles to Smyrna	12	13.00	2.50
Marseilles to Beirut	13	13.00	2.50
Marseilles to Maurice	11.5	20.00	3.86
Marseilles to Nouméa	15	31.00	5.98
Marseilles to Yokohama	13	31.00	5.98
England.			
Southampton to Colon	13	19.00	3.66
Southampton to the Cape	13.1	10.69	2.06
Brindisi to Adelaide	12	14.01	2.70
Brindisi to Bombay	12.05	25.30	4.88
Suez to Shanghai	11.05	25.30	4.88
Vancouver to Hongkong	12	28.00	5.40

Subsidies paid by various nations, etc.—Continued.

Itinerary.	Average obligatory speed.	Subsidy by marine league.	
Germany.	*Miles.*	*Francs.*	
Hamburg to Natal	10.5	12.63	$2.43
Bremerhaven to Sydney	11.5	20.97	4.05
Singapore to New Guinea	11.5	20.97	4.05
Bremerhaven to Shanghai	12	20.97	4.05
Hongkong to Bremerhaven	12	20.97	4.05
United States.			
New York to Colon	14	15.75	3.04
Galveston to La Guayra	12	10.50	2.02
San Francisco to Panama	12	10.50	2.02
New York to Buenos Ayres	12	10.50	2.02
New York to Rio de Ianeiro	12	10.50	2.02
San Francisco to Hongkong	14	31.50	6.07
Spain.			
Cadiz to Habana	12.5	30.54	5.89
Colon to Panama and San Francisco	10	30.54	5.89
Barcelona to Manila	11.15	21.45	4.14
Liverpool to Manila	11.15	21.45	4.14
Austria.			
Trieste to Santos	9	12.60	2.43
Trieste to Constantinople	9	11.34	2.18
Trieste to Bombay	11	18.54	3.57
Trieste to Shanghai	9	10.71	2.06
Italy.			
Genoa to Alexandria	11	17.00	3.28
Alexandria to Massaua	11	30.00	5.79
Alexandria to Bombay	11	30.00	5.79

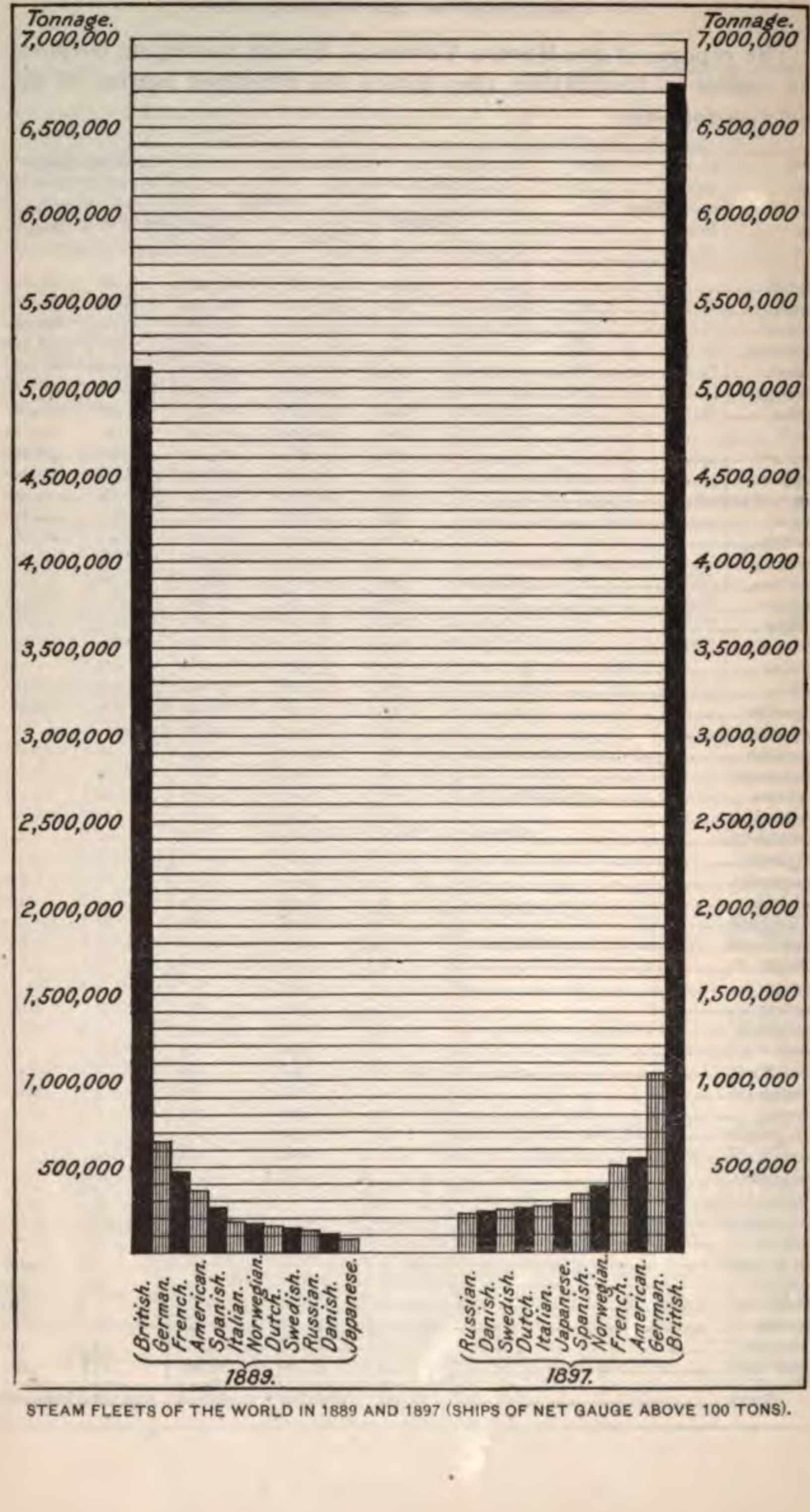
FRENCH NAVAL CONSTRUCTION.

Construction in metal only.	Gross tons.
1881	9,776.37
1882	58,186.8
1883	38,416.44
1884	54,667.95
1885	11,573.73
1886	31,707.8
1887	15,643.13
1888	24,448.72
1889	35,341.7
1890	30,577.55
1891	31,572.89
1892	19,903.71
Total	361,816.79
Annual average	30,150
1893	18,658.57
1894	14,223.04
1895	21,239.59
Total	54,121.2
Annual average	18,040

SHIPPING OF THE WORLD.

The reports of the Bureau Veritas (a French surveying corporation similar to Lloyds) for 1895 divide the merchant marine of the world as follows:

Flag.	Steamships.			Sailing ships.	
	Number.	Tonnage.		Number.	Tonnage (net).
		Gross.	Net.		
English	5,690	10,245,577	6,413,276	8,726	3,267,625
German	831	1,360,472	896,346	1,096	566,973
French	532	933,244	488,676	1,425	252,940
American	477	761,707	529,716	3,881	1,358,467
Spanish	365	519,315	339,220	1,115	167,143
Norwegian	551	494,612	314,304	2,801	1,176,174
Italian	222	344,523	218,592	1,692	472,002
Dutch	204	320,794	222,430	642	139,649
Japanese	267	313,563	192,400	249	32,880
Russian	314	277,302	179,149	1,753	363,046
Austro-Hungarian	156	254,269	154,521	209	67,951
Danish	265	248,773	150,445	795	149,843
Swedish	427	233,777	161,078	1,444	285,665
Greek	107	144,975	88,968	1,059	246,196
Brazilian	314	139,305	88,908	320	73,519
Belgian	66	129,399	91,266	10	2,256
Turkish	81	69,572	42,164	1,247	241,096
Portuguese	32	55,229	36,542	202	46,820
Chinese	37	53,385	33,985	13	1,318
Chilean	36	45,321	30,064	142	73,162
Argentine	61	43,317	28,116	154	38,071
Egyptian	16	22,457	11,129	....	....
Hawaiian	18	16,245	11,539	28	17,221
Uruguayan	19	9,415	6,018	51	12,419
Peruvian	6	6,414	4,235	54	22,282
Mexican	12	4,699	2,517	51	9,281
Zanzibar	3	3,660	1,879	....	....
Bulgarian	3	3,120	2,171	....	....
Roumanian	5	2,852	1,508	18	3,210
Sarawak	3	2,184	1,364	1	347
Nicaraguan	2	2,158	1,386	20	10,453
Venezuelan	5	2,033	1,008	16	2,816
Haitian	4	1,488	739	17	4,218
Korean	2	1,245	847	....	....
Siamese	3	975	559	14	4,580
Colombian	1	881	457	7	1,770
Persian	1	838	579	1	608
Costa Rican	2	528	240	2	551
Dominican	2	489	239	7	1,257
Borneo	1	363	235	....	....
Paraguayan	1	282	232	....	....
Servian	1	264	112	....	....
Guatemala	....	....	....	16	4,351
Arabian	....	....	....	5	4,235
Montenegran	....	....	....	27	3,243
Bolivian	....	....	....	3	2,214
San Salvador	....	....	....	4	1,109
Tunisian	....	....	....	3	635
Ecudorean	....	....	....	1	386
Liberian	....	....	....	2	317
Honduras	....	....	....	2	199
Unknown	10	18,575	11,857	23	5,062
Total	11,155	17,089,596	10,761,025	29,348	9,135,560



STEAM FLEETS OF THE WORLD IN 1889 AND 1897 (SHIPS OF NET GAUGE ABOVE 100 TONS).

Dividends paid 1892–1896 and net tonnage of principal German lines.

Line.	1892.		1893.		1894.	
	Dividends.	Net tonnage.	Dividends.	Net tonnage.	Dividends.	Net tonnage.
	Per ct.		*Per ct.*		*Per ct.*	
German-Australian Line	....	13,364	....	15,869	....	12,464
Hansa	3	32,427	4.5	34,771	6	41,852
Kosmos	2.5	24,679	7	25,052	4	28,667
Kingsin Line	....	21,835	....	22,849	3	24,188
Levant	....	5,157	....	9,017	....	7,698
East Africa	....	9,059	....	10,957	....	11,790
Hamburg-American Line	....	93,289	....	100,796	....	118,463
Calcutta Line	....	9,926	....	9,726	....	9,926
Pacific Line	....	16,331	....	15,399	....	17,500
South American	10	46,975	10	43,744	12	47,393
North German Lloyd	1.5	141,519	3	129,254	....	138,418

Class.	1895.		1896.		Average.
	Dividends.	Net tonnage.	Dividends.	Net tonnage.	
	Per ct.		*Per ct.*		*Per ct.*
German-Australian Line	....	16,248	5	18,198	17
Hansa	6	48,790	....	51,606	3.9
Kosmos	8	33,312	11	40,371	6.5
Kingsin Line	8	23,836	5	27,068	3.2
Levant	....	10,288	....	9,567	....
East Africa	....	13,226	6	18,743	1.2
Port Company	2	....	6	....	1.6
Hamburg-American Line	....	126,924	8	125,516	2.6
Calcutta Line	....	9,926	....	15,995	....
Pacific Line	....	19,609	5	19,557	1
South American	7	67,416	10	65,558	2.5
North German Lloyd	....	142,547	4	145,493	1.7

ROBERT P. SKINNER,
Consul.

MARSEILLES, *July 20, 1899.*

MARSEILLES: SUPPLEMENTARY.

SEAMEN'S WAGES.

The consuls of the various powers consulted are unable to state accurately in every case the cost per day of supporting officers and crews. The British consul reports that the average allowance for officers is $1.21 and for men 36 cents per day. The Italian consul-general allows 30 cents for officers and 19 cents for crew. The consul for Sweden and Norway reports an average allowance of 41 cents for officers and men. The consul-general for Austria-Hungary allows 38 cents for officers and 30 cents for crew. Other consuls are silent on the point. Without going into details, any condensed table such as the one that follows must be open to more or less misunderstanding. However, the figures as stated are accurate, and have been obtained from the French commissioner and the consuls of the several countries named.

Table of monthly wages paid at Marseilles to officers and crews of ships of various nationalities signed at this port.

Country.	First mate.	Second mate.	Able-bodied seamen.	Carpenter.
France	$38.60 to $57.90	$28.95 to $34.74	$13.51 to $12.54	$15.44
Great Britain	60.58	36.00	17.00 to 19.40	$29.19 to 34.06
Greece	19.30 to 38.60	13.51 to 38.60	7.72 to 15.44	15.44 to 19.30
Sweden and Norway	21.23	16.20	11.58	19.30
Italy	23.16 to 28.95	19.30	10.61	13.51 to 15.44
Germany	13.51 to 17.37	11.58 to 13.51	10.61	15.44
Austria-Hungary	32.00	24.00	9.60	16.00

Country.	Cook.	Steward.	Ordinary seamen (novice).
France	$19.30 to $38.60	$12.73 to $24.12	$7.72
Great Britain	19.46 to 24.33	32.84	$9.73 to 12.16
Greece	9.65 to 15.44	9.65 to 15.44	....
Sweden and Norway	13.51 to 19.30	7.72 to 9.65	....
Italy	10.61	9.65	....
Germany	15.44 to 13.51	17.37 to 19.30	7.72 to 9.65
Austria-Hungary	11.20	8.00	8.00

ROBERT P. SKINNER,
Consul.

MARSEILLES, *November 10, 1899.*

TOULON.

[Report from Acting Consular Agent Jouve, forwarded by Consul Skinner, of Marseilles, July 24, 1899.]

Many war ships are built in Toulon by the French Government on its own docks, and for France and other countries on a private dock at La Seyne, in the roadstead of Toulon. Many merchant ships of all sorts are also built at La Seyne; of late, four-masted sailing ships have been turned out; but the construction of men-of-war seems to have no effect on prices of merchant-marine ships.

The principal materials for shipbuilding are manufactured and bought in France; timber is imported from Norway; teak wood comes from London, which has a monopoly of it; no more lumber or timber comes from Russia or Canada, as heretofore.

The most recent prices of steel in contracts made here for the French navy are, per kilogram (2.2046 pounds):

Description.	Price.	
Steel plates:	*Francs.*	
For belt of armor	2.50	$0.482
Thin, for belt of armor	2.49	.48
Protected deck	1.90 to 1.98	$0.366 to .382
Broad	31.00 to 32.00	5.98 to 6.18

In the navy, the daily wages of workmen are divided into four classes:

Class.	Minimum.		Maximum.	
First:	*Francs.*		*Francs.*	
Chief foreman	5.40	$1.04	6.80	$1.31
Foreman	4.70	.907	6.30	1.22
Second:				
Chief workman	4.20	.81	5.40	1.04
Workman—				
First class	4.10	.79	4.70	.907
Second class	3.40	.66	4.00	.77
Third class	2.70	.52	3.30	.636
Fourth class	2.00	.39	2.60	.50
Third (novice)	.60	.12	1.50	.29
Fourth:				
Chief journeyman	2.50	.48	3.50	.68
Journeyman	1.80	.35	2.90	.56

After twenty-five years of service and 50 years of age, an annual pension is granted, as follows:

Class.	Minimum.		Maximum.		Widows.	
	Francs.		*Francs.*		*Francs.*	
Chief foreman	1,130	$218.09	1,390	$268.27	695	$134.14
Chief workman	700	135.10	900	173.70	450	86.85
Foreman	850	164.00	1,110	214.23	555	107.21
Chief journeyman workman	600	115.80	750	144.75	375	72.38
Novice journeyman	580	111.94	530	102.29	375	72.38

At the private building place at La Seyne the general wage is about 4 francs (77 cents) to 5 francs (97 cents) a day, the lowest being 2.60 francs (50.1 cents) and the highest 6 to 7 francs ($1.16 to $1.35); but generally, work is taken by groups of workmen at a fixed price and the pay per day varies.

GERMANY.

In the whole record of German progress and development during the past thirty years, no chapter is more striking than that which describes the growth and improvement of its commercial marine, which now ranks second among European nations to that of Great Britain alone. The two largest, wealthiest, and most powerful steamship companies in the world are German and are located at Hamburg and Bremen, and the whole merchant marine of Germany included, on January 1, 1898 (the date of the last published official statistics), 2,522 sailing vessels of 585,571 tons net measurement, manned by 14,162 sailors, and 1,171 seagoing steamers of 969,800 tons and crews numbering 28,266 men, a total of 3,693 seagoing vessels of 1,555,371 tons net measurement and manned by 42,428 men.

The process of development has been, here as elsewhere, an increase in the size of vessels, the elimination of sailing ships and their substitution by steam craft, and a steady decrease in the number of men employed in proportion to the tonnage under steam and sail. Thus, on January 1, 1871, the German merchant fleet included 4,372 sailing vessels with a tonnage of 900,301 and manned by 34,739 men. During the intervening twenty-nine years the sailing vessels, as we have seen, fell away to the extent of 1,820 ships, 314,730 tons, and 20,577 men.

Of the 2,552 sailing vessels now under the German flag, 1,986 are of wood; but they are mainly small, so that the remaining 566 modern steel and iron sailers comprise more than two-thirds of the entire tonnage of the sailing fleet.

The whole seagoing steam merchant marine of Germany is of iron and steel and comprises a relatively large number of the largest, fastest, and most powerful steamships in the world. The growth of this branch of the merchant service has been almost phenomenal and vindicates, if any vindication were required, the active and liberal governmental policy by which it has been fostered. In 1871, Germany had in her ocean service only 147 steamers, with a tonnage of 81,994 and 4,736 men, the average capacity of the ships being only 558 tons. The statistics for 1898 show, as has been seen, an increase of 1,024 steamers, 887,906 tons, and 23,530 men. The average tonnage per vessel increased from 558 to 828 and the average crew decreased from 32 men to 24.

A forcible illustration of the growth and importance of the German merchant marine is furnished by the statistics of the single port of Hamburg. During the year 1898, there were in operation from that port 112 regular lines of steamers, of which 61 flew the German flag. These lines operated 792 steamers, of which 495 were of German register. They made a total of 6,247 voyages and carried 4,500,000 tons of freight, as compared with 4,683 voyages and 3,500,000 tons carried in 1890. Germany has to-day 27 regular lines of steamships to European ports and 34 to the rest of the world—the Americas, Africa, Australasia, Asia, and every island of the sea that offers a present or promises a future trade with the Fatherland. Of the entire tonnage carried by these lines last year, 1,793,742 tons were for European ports and 2,663,407 tons were for countries outside of Europe.

The two greatest German steamship companies, viz, the North German Lloyd and the Hamburg-American Company, have their headquarters or home ports respectively at Bremen and Hamburg, and are entitled in a report of this character to a separate and somewhat detailed description.

The North German Lloyd Company was founded with 3,000,000 florins capital in 1857, just ten years after the *Washington* had made the first steamship voyage from New York to the mouth of the Weser. By virtue of able management and that intelligent enterprise which is always content with moderate dividends and willing to invest its surplus earnings in the renewal, increase, and improvement of its equipment, the Lloyd has risen in forty-two years to a foremost position among all organizations of its class, with an active capital of more than 100,000,000 marks ($23,800,000) and 73 steamships in actual service which aggregate 237,550 horsepower and 266,138 gross tons register. At the head of this fleet stands the *Kaiser Wilhelm der Grosse*, with engines of 28,000 horsepower, 14,349 tons register, and the blue ribbon of the sea for speed in successive trans-Atlantic voyages.

On the 25th of April last the company had under construction 10 steamships, of which 1, the *Grosser Kurfürst*, is of 12,500 tons, 4 others of 10,000 tons each, 3 of 7,500, and 2 of 5,000 tons each, the whole aggregating 51,000 horsepower.

As already indicated, a notable feature in the management of this company has been its readiness to spend large sums of money in keeping its fleet up to the highest standard of efficiency, sacrificing vessels while still capable of fairly good service, and replacing them with others of a larger, faster, costlier, and more modern type. Of its whole active fleet, only two steamships remain which were in service in 1886, thirteen years ago. Since that time, the company has sold 26 steamers and built or bought 51. It carried in 1898, 161,963 passengers, of whom 114,268 were between Europe and North America. At the close of last year, the North German Lloyd had carried on transoceanic voyages 3,709,980 passengers, and during that one year transported 1,983,482 cubic meters of freight. Its principal lines are from Bremen direct to and from New York, Baltimore, Galveston, South America, eastern Asia (China and Japan), and Australia, besides a regular line between Genoa and New York.

The company has sold during the past year three steamers—the *Fulda*, *Havel*, and *Werra*—which would have been considered first-class vessels five or six years ago, and rejected the *Kaiser Friedrich*, a new vessel of 12,431 tons and 25,000 horsepower, because she did not fulfill the contract specifications as to speed.

The Hamburg-American Steamship Company was founded in 1847, with 465,000 marks ($106,950) capital, and began business with two large sailing ships, which in that year carried 168 passengers between Hamburg and New York. For more than fifty years, the company has grown and developed along the same lines as its great rival in Bremen, until at the beginning of 1897 it had in service 64 ocean steamers with 241,507 tons register and 164,255 indicated horsepower. These included steamships like the *Fürst Bismarck*, *Normannia*, *Augusta Victoria*, and *Columbia*, of more than 8,000 tons and up to 16,400 horsepower, two of which were sold to Spain because they no longer fulfilled the requirements of the company's trans-Atlantic service. At the same date (January, 1897), it had in construction 4 ships—the *Pretoria*, *Brasilia*, *Belgia*, and *Patricia*—3 of 10,000 tons each and 1 of 13,500 tons, which have since been completed and put into service. Of all the vessels which carried the flag of the Hamburg-American Company in 1886, but 3 were on its active list in 1896, and it had meanwhile lost 1 steamer, sold 32, and built or purchased 72. Its capital has grown to 78,000,000 marks ($18,564,000), and, together with the North German Lloyd, it controls more than one-half of the entire steam merchant fleet of Germany.

STEAMSHIP BUILDING IN GERMANY.

During the period from 1830 to 1850, the wooden sailing vessels which constituted Germany's merchant fleet were built mainly at shipyards on the Elbe, the Weser, and along the coast of the North Sea, all of which were at that time in a highly flourishing condition. In those days, master shipbuilders had usually taken a course of study at the shipbuilding school in Copenhagen and served a subsequent apprenticeship in some American shipyard, where they studied the art of building those famous clipper ships which held the record for speed and weatherly qualities. Hamburg and Bremen had meanwhile started private schools to teach young workmen the rudiments of ship construction, and about 1836 the Prussian Government founded near Stettin a technical high school in which there was a preparatory course in higher mathematics and a full course of study in theory and ship construction. All this, however, related to wooden vessels, and the effect of such instruction was seen in the fine, large, clipper-built sailers that went out between 1850 and 1860 from Bremen and Hamburg, carrying the steadily growing throng of emigrants who swarmed to those ports for passage to the United States—for it was the emigrant trade that laid the keels, so to speak, of the two great German steamship companies of to-day.

Then came the period when Great Britain—which had first built ocean steamships—substituted iron for wood in shipbuilding and took the lead in the new era of construction.

Germany was handicapped in the start by want of resources and experience in iron working and still more by a general lack of confidence—even on part of German shipowners—that the shipyards of this country could turn out iron vessels comparable in quality and price with those produced by British constructers. The managers of the Lloyd and Hamburg companies shared this distrust, and down to as late a date as 1880 their steamers were practically all built on the Clyde and the Mersey.

Meanwhile, ten years earlier, and just before the memorable epoch of 1870, the Prussian Government had established at Kiel and Wilhelmshaven yards for the construction and repair of war vessels, which work had been hitherto done almost exclusively in this country at Danzig. The events of 1870 made it imperative for the newly consolidated German Empire to build and equip a navy in its own shipyards and at the earliest possible moment. The Government yards were inadequate to the task, so a contract was given to the private Vulcan shipyard at Stettin for the construction of the armored frigate *Preussen*, which was so quickly and satisfactorily executed that a second vessel, the armored corvette *Hansa*, was ordered. The building of the *Preussen* marks the date of the revival. The confidence of the admiralty was secured; it was shown that armored war vessels could be designed and constructed in Germany, and to-day, the Vulcan shipyard builds steel cruisers and battle ships not only for the Fatherland, but for Japan, China, and the republics of South America.

The great merchant shipowners were still skeptical, however, and it was not until fifteen years after the launch of the *Preussen* that the North German Lloyd and the Hamburg-American gained sufficient confidence in their home builders to withdraw their patronage from British constructers. That they did this at all was mainly due to the fact that they were forced into it by an act of legislation. About 1884, the imperial statute was enacted granting important subsidies to the North German Lloyd for a line of mail steamers to eastern Asia and Australia, with the stipulation that the steamships receiving such subsidy must be built in German shipyards by German workmen and, so far as was practicable, of German materials. A contract for six imperial mail steamships was let to the Vulcan Company, and they were delivered during 1886 and 1887. Each ship met every requirement, and the six collectively demonstrated that steamship building had reached in Germany the best standard of British and French construction. The effect was a rush of orders for both war and merchant steamers, not only to the Vulcan works, but to the Germania yard at Kiel belonging to the Weser Company, to Schichau at Danzig, and to others.

The latest productions of the Vulcan yard—ships like the *Kaiser Wilhelm der Grosse*, *Friedrich der Grosse*, and *Königin Luise* of the German Lloyd and the *Augusta Victoria*, *Fürst Bismarck*, *Patricia*, and *Palatia* of the Hamburg-American—place the Vulcan works at Stettin in the front rank of modern steamship builders. They were established in 1851 by a private firm; in 1857, this was converted into a stock company with 1,000,000 thalers ($714,000) capital, which has been since increased to $1,904,000, with plant and property valued at $5,500,000. The entire plant covers 58 acres, and the actual floor area of its workshops is more than 60,000 square yards. The company now employs 6,500 workmen and has built in all 247 ships, of which 61 were war vessels, 137 mercantile steamers with single or double screws, and 49 paddle boats for river and estuary service where light draft of water was an essential requisite.

The merchant marine of Germany is under the general supervision of the marine bureau of the Department of the Interior (Reichsamt des Innern), No. 74 Wilhelm Strasse, Berlin, and elaborate statistics of new constructions, losses through shipwreck, etc., are published every two years in an official report.

The materials for shipbuilding, although largely of German origin, include a considerable proportion of foreign materials imported under the law of July 15, 1879, which grants free entry to all materials, fixtures, and even guns, which are to be used in the construction, repair, and equipment of both war and mercantile vessels. Under this provision there were imported free during the year 1898, 4,498 tons of pig iron, 8,969 tons of structural iron, 5,048 tons of wrought cranks and shafting, 28,246 tons of steel and iron plating for hulls, 1,280 tons of anchors, 1,252 tons of heavy castings, 69,268 tons of sawed lumber, 72,234 tons of hewn timber, besides quantities of cordage, hemp, and other materials.

The chief source of the iron and steel employed in ship construction is Westphalia, whence it is transported to the northern shipyards either by water via the Rhine and North Sea or across country by rail, special low rates being granted on the Prussian Government railways for all materials intended for this purpose. One of the most potent arguments in favor of the Dortmund-Ems Canal, which was opened from Dortmund to Emden during the past summer, was that it would facilitate the shipment of iron and steel for shipbuilding purposes from the interior of Westphalia to the shipyards on the northern coast.

The great steel works of Friederich Krupp, at Essen, make not only guns and armor plate for war vessels, but all kinds of large forgings, stems rudder frames, propeller shafts, and heavy framework and engine parts for both war and merchant steamers. But the principal shipyards at Hamburg, Kiel, Stettin, and Danzig are so fully equipped as to be practically independent of outside assistance in these respects.

GOVERNMENT SUPPORT OF SHIPBUILDING AND NAVIGATION.

It has been shown in this report that the turning point in the development of naval construction in Germany was during the years immediately following 1870, when the necessity of beginning immediately an armored fleet for the newly consolidated Empire compelled the admiralty to not only increase the equipment and capacity of its own shipyards, but to give contracts for ironclad vessels to private German constructers. Similarly, the first real opportunity given to a home shipyard by either of the great navigation companies at Bremen and Hamburg was when a Government subsidy compelled the Lloyds to place a contract for six imperial mail liners for the China and Australian service where they could be built by German workmen, and, as far as practicable, with German materials. We have seen that since 1879, all materials needed and used for shipbuilding have been imported free of duty, and that the Government railways have hauled steel, iron, lumber, etc., from foundries to shipyards at the bare cost of handling and transportation.

All this was much, but it can safely be said that the great lines which now connect the two principal German ports with Asia, Australasia, and the German colonies in East Africa would not and could not have been established and maintained during the earlier years of struggle and uncertainty had they not received the direct, liberal, and assured support of the Government through fixed annual subsidies.

This policy was inaugurated under the vigorous leadership of Prince Bismarck, then Chancellor of the Empire, who, on April 6, 1881, submitted to the German Parliament a long and elaborate memorial, based upon a review of the French mercantile-marine act of January 29 in that year, which appropriated $4,590,000 per annum as subsidies to steamship lines from France to Corsica, Brazil and La Plata, New York and West Indies, India, China, Algiers, and Tunis. The memorial also showed in detail how Great Britain was paying annually at the same time in postal subsidies £641,656 approximately $3,118,448) for lines to South America, East Indies, China, Japan, West Indies, Africa, and the United States; while Italy expended for similar purposes, in 1879, $1,593,214 and Austria, $1,034,844.

Germany had, at that time, been living about eleven years under an imperial government, and was rapidly changing from an agricultural to an industrial and commercial nation. Bismarck had the sagacity to see that the time would soon come—had indeed come—when Germany must have new and extended foreign markets for her surplus manufactured products or languish from congestion, as her productive energies overran the purchasing power of her own people. His appeal to the Reichstag was based upon the experience and adopted policies of France and Great Britain, the rivals from whom Germany had then most to fear, and met with immediate and cordial response.

A convention was framed and entered into by the Imperial Government and the North German Lloyd Steamship Company, by which the latter bound itself to establish and work for fifteen years three main lines of steamships: One, from Bremerhaven to China, with a branch line from Hongkong via Yokohama and Hiogo to Korea; second, a line from Bremerhaven to Australia, by way of a Dutch or Belgian port, with a branch service from Sydney via the Tonga Islands to Apia and back to Sydney; and, third, a line from Trieste via Brindisi to Alexandria. The contract included thirty-four sections and prescribed in full detail the number of voyages to be made by each line, the average speed to be maintained, the number and tonnage of new liners to be built in German yards of German material and manned throughout by German subjects; fixed penalties for violation or neglect of any stipulation; prescribed reduced rates for transportation of German officers, soldiers, marines, and civil officials, etc. For this service, the Imperial Government bound itself to pay a yearly subsidy of 4,400,000 marks ($1,047,500). The first steamer on the China line left Bremerhaven on June 30, 1886, with imposing ceremonies befitting such an occasion, stopped at Antwerp, where similar proceedings took place, and then sailed away for Hongkong, thereby opening what was felt to be an important new chapter in the commercial development of Germany. The success of the Asian and Australian lines in opening new fields for German export pointed the way to a second enterprise of the same character, and on May 9, 1890, a new convention was made with the North German Lloyd Company to put on a monthly line of steamships between Hamburg and Delagoa Bay, via Lisbon, Naples, Port Said, Aden, Zanzibar, and Dar es-Salaam, with coast lines between Zanzibar and Lamu, Bagamoyo, Saadani, Pangani, Tonga, Kilwa, Lindi, Ibo, and other African ports. For this service, the Government bound itself to pay an annual subsidy of 900,000 marks ($214,200). These contracts have been amended and enlarged, always with the purpose of securing higher speed, more frequent voyages, and better service.

After fifteen years of successful operation, the original contract for the eastern Asia and Australian lines was renewed for a similar period, with various modifications, on the 30th of October, 1898. Among the more important changes were the following:

The terminus of the China line was made at Shanghai, instead of Hongkong, and it includes intermediate stoppages at a port in Belgium or Holland, at Genoa, Naples, Port Said, Suez, Aden, Colombo, and Singapore.

A separate principal line is established between Bremen or Hamburg and Japan, with terminus at Yokohama and stops at Hiogo, Nagasaki, Hongkong, and the other intermediate ports specified for the China line.

Branch lines are provided from Hongkong to Shanghai and another branch from Singapore to several specified ports in the Dutch East Indies and Sunda Archipelago to New Guinea.

The maximum standard speed is raised to 13½ knots per hour, and all new steamers built for this service shall be of not less than 6,000 tons register.

The new contract took effect on the 1st of April last, and for its fulfillment the company is to receive in monthly payments an annual subsidy of 5,590,000 marks ($1,330,420).

The next step in contemplation is the establishment of a new monthly line by the Hamburg-American Company direct to the German Chinese port of Kyao-chau, and, for this purpose, a bill is in preparation to be submitted to the Reichstag at its coming session.

When it is considered what the East Asian, the Australian, East African, and Mediterranean lines of the North German Lloyd have done for the foreign commerce and the national influence and progress of Germany during the past fifteen years, at an expenditure of a little more than $1,250,000 per annum, there is presented a striking lesson of what can be done by persistent, well-sustained effort, carefully planned and faithfully carried out. The convention of October 30, 1898, between the Imperial Government and the North German Lloyd comprises forty-four articles, and an official copy is transmitted with this report as an example of a German State paper in which every contingency is foreseen, and no detail, however minute, omitted which can contribute to the completeness of the service which is therein provided for and secured.

Not only has the German merchant marine been thus liberally and consistently supported by subsidies of money from the public treasury, but it has been encouraged, applauded, and honored by the entire influence of the Imperial Government, which in a country like this, where royal favor is so potent and eagerly sought for, is an important element of success. The Emperor is not only an enthusiastic yachtsman and sailor, but he is under all circumstances an ardent and powerful advocate of expansion and improvement of the German fleet and merchant marine. No capitalists or business men are more honored in Germany than those who have contributed to these results. When in November last, Consul Meier, founder of the North German Lloyd Company, died in his ninetieth year, the honors bestowed upon his memory were of princely splendor and solemnity. When Captain Schmidt brought home the lame and battered *Bulgaria* from her long, perilous battle with wintry seas, the Emperor's thanks and medals met him at the gang plank, and he and his men became heroes in the recognition of their Government and countrymen.

There are not lacking conservatives—mainly agrarians and socialist reactionaries—who have opposed this policy as they oppose improvements in the canals and internal water routes of this country, but they do not control the policy of Germany, and, in all probability, never will.

Wages of shipbuilders and seamen, per day.

Workmen.	In shipyards at Bremen.	Vulcan yard. Stettin.
Pattern makers	$0.71	$0.75 to $1.00
Machinists	.85	.75 to 1.25
Boiler makers	.87	75 to 1.25
Plumbers and fitters	.73	.60 to 1.00
Carpenters and joiners	1.00	.75 to 1 10
Drillers	.70	.75 to 1.00
Painters	.90	70 to 85
Riveters	.85	.60 to .80
Calkers	.85	60 to 80
Furnace men	.78	.75 to 1 00
Sheet-iron workers	.94	.70 to .85
Molders	.83	.65 to .85
Laborers	.80	.60 to .70

Wages on shipboard, per month.

Crews of steamships:	
Seamen—	
Able	$11.90 to $10.71
Ordinary	7.14 to 9.00
Engineers—	
First	101.19 to 65.00
Second	71.90 to 43.00
Third	47.62 to 25.00
Firemen	14.28 to 11.90
Trimmers	11.55 to 14.55
Deck hands	4.76 to 6.00
Carpenters	15.50 to 19.00

Crews of steamships—Continued.	
Stewards—	
Common	$6.00 to $10.00
Chief	19.00 to 28.50
Crews of sailing vessels:	
First officers	26.50 to 30.00
Second officers	18.56 to 20.00
Third officers	16.00 to 18.00

As a principle, wages on leading steamship lines which make long voyages to distant continents are higher than those paid for corresponding service on lines which ply to British, Mediterranean, and other European ports; but all are comprised within the maximum and minimum rates above given.

FRANK H. MASON,
Consul-General.

BERLIN, *October 25, 1899.*

HAMBURG.

The condition, extent, and importance of the Hamburg merchant marine is shown by the inclosed statistics, which have been taken from the existing public records and can therefore be relied upon.

GOVERNMENT AID.

The German Government is most liberal in spending money to promote the interests of its merchant marine, which is greatly furthered by the following institutions:

(1) The Seemanns Amt (seamen's bureau), an institution governed by the State of Hamburg, organized for the supervision and control of the shipping and discharging of seamen. In foreign countries, this institution is represented by the German consulates.

(2) The Seewarte (maritime observatory). This is a model institution, since 1875 governed by the State. Its chief objects are:

(*a*) The promotion of traffic and increase in safety of seagoing vessels as well as of their passengers and crew.

(*b*) The collection of the records of the physical condition of the seas and all meteorological observations, the publishing of meteorological weather reports, which are given free of charge to the captains of all ships touching the port of Hamburg.

(*c*) The furnishing to shipowners of nautical, meteorological, and magnetic instruments, etc., which have been carefully tested by the experts of the institute, in order to ascertain the reliability of such instruments; testing of sextants, octants, and compasses free of charge and instructing seamen in the handling of new nautical instruments. A great number of experts are employed by the Government of Hamburg to supervise this part of the institute.

(*d*) Supervision and investigation of the condition of the coasts.

It has its own telegraphic connection with nearly all European seaports. A weather report, containing valuable information for ships leaving this port, is published twice every day:

(*e*) Testing chronometers, for which it has a special department.

(*f*) Publication of hydrographical maps of great accuracy. In 1889, upon suggestion of the said Seewarte, the German Government spent many millions of marks to introduce a uniform system of signal posts, etc. A number of old sea captains were engaged to superintend this work, and valuable books were published to make the system known to everybody interested as far as possible.

The merchant marine of Hamburg is supervised by the deputation of commerce and marine (Deputation für Handel und Schifffahrt), a subdepartment of the Hamburg Senate. Whatever recommendations or suggestions are made for the improvement of the merchant marine by chambers of commerce, boards of trade, and similar organizations must be brought to the knowledge of the Government by the said deputation.

BOUNTIES.

In 1891, the Government, upon the suggestion of the chamber of commerce, concluded to pay premiums to shipowners for promoting the interests of the merchant marine. Over 10,000,000 marks ($2,380,000) have been paid as premiums for new-built ships, and about the same amount has been paid to shipowners and steamship companies to aid their efforts in increasing the efficiency of mail carriage by steamships.

MARITIME SCHOOLS.

In 1884, the Government decided to erect maritime schools. The first school was opened in Hamburg and purposed to instruct boys from 13 to 17 years who intended to go to sea. The results were very satisfactory. Six schools have since been erected, and the number of able seamen graduated from such school has considerably increased.

The German Government further decided to enforce the physical examination of sailors before granting them a permit to ship on German mercantile vessels. In consequence of this regulation, it was found necessary to increase the number of surgeons permanently engaged by the State of Hamburg. The examination is free of charge, the Hamburg Government paying all expenses connected with the carrying out of these regulations.

SHIPBUILDING.

The German Government owns three shipbuilding yards—one at Kiel, one at Wilhelmshaven, and one at Danzig—which are exclusively used for the building of vessels for naval purposes. Since

1873, the following war ships have been built for the German navy: Five armored frigates, 8 armored corvettes, 13 gunboats, 2 artillery ships, and 10 torpedo boats. Besides the imperial shipbuilding yards, private yards are to a great extent employed in building vessels for naval purposes, as the three imperial yards do not have sufficient capacity to supply the demand; however, the building of ships in private yards does not affect the cost of constructing merchant ships.

In case of war, if such necessity arises, vessels of the merchant marine are used for auxiliary naval forces. Such ships are chartered by the Government; but in the event of shipowners declining to surrender their ships, the law provides that they can be compelled to do so.

WAGES.

Average wages paid in shipbuilding yards at Hamburg and Kiel.

Workmen.	Hamburg (weekly).		Kiel (per hour—10 working hours per day).	
	Marks.		*Pfennigs.*	*Cents.*
Pattern makers	70 to 80	$16.66 to $19.04	....	....
Machinists	52	12.37	....	....
Riveters	40 to 45	9.52 to 10.71	45	10
Ship carpenters	40	9.52	30 to 36	7 to 8
Joiners	40	9.52	40	9
Painters	36	8.57	32 to 36	7 to 9
Furnace men	30	7.14	35 to 40	8 to 9
Riggers	36	8.57	30	7
Plumbers	30	7.14	30 to 38	7 to 9
Sheet-iron workers	28	6.66	30 to 38	7 to 9
Iron molders	28	6.66	34 to 35	8 to 8.3
Brass molders	28 to 30	6.66 to 7.14	34 to 35	8 to 8.3
Laborers	14 to 28	3.33 to 6.66	28 to 30	6 to 7

Average monthly wages paid for seamen, etc.

Class.	Port of Hamburg.				Lower Baltic.			
	Steamships.		Sailing vessels.		Steamships.		Sailing vessels.	
	Marks.		*Marks.*		*Marks.*		*Marks.*	
Able seamen	56	$13.33	48	$11.42	55	$13.09	50	$11.90
Boatswain	66	15.71	59	14.04	70	16.66	65	15.47
Carpenters	73	17.34	60	14.28	80	19.04	80	19.04
Quartermasters	75	17.85	60	14.28	....	....	....	....
First mates	125	29.75	100	23.80	100	23.80	100	23.80
Second mates	90	21.42	80	19.04	75	17.85	75	17.85
Firemen	60 to 65	$14.28 to 15.47	....	....	55	13.09	....	....
Coal passers and oilers	60 to 65	14.28 to 15.47	....	....	....	....	....	....
First engineers	250 to 300	59.50 to 71.40	....	....	180	42.84	....	....
Second engineers	150 to 180	35.70 to 42.84	....	....	100	23.80	....	....
Third engineers	100 to 140	23.80 to 33.32	....	....	85	20.23	....	....

Gradation of the net tonnage of ocean vessels.

Description.	Style of ship.									Net tonnage in registered tons.			Regular crew.	Indicated horse-power of engines.
	Frigate.	Bark.	Three-mast schooner.	Schooner brig and brigantine.	Schooner.	Galiote.	Kuff.	Steamer.	Total.	Sailing vessels.	Steamers.	Total.		
Without net tonnage	...	...	1	...	2	...	...	21	24	...	...	...	137	5,920
Less than 30 registered tons	...	...	...	...	1	...	28	23	52	557	339	896	208	6,675
30 to 50 registered tons	...	...	...	...	1	3	13	3	20	640	115	755	83	1,100
50 to 100 registered tons	...	...	...	...	2	14	8	4	28	1,600	323	1,923	138	1,060
100 to 150 registered tons	...	...	...	2	2	7	18	4	33	3,825	535	4,360	117	1,055
150 to 200 registered tons	...	...	...	1	2	7	3	1	14	2,167	168	2,335	58	210
250 to 300 registered tons	...	...	5	...	...	...	4	5	14	2,485	1,425	3,910	152	2,670
300 to 400 registered tons	...	2	2	...	1	2	15	17	39	7,594	5,902	13,496	369	7,715
400 to 500 registered tons	...	5	4	...	...	...	2	21	32	4,885	9,364	14,249	451	11,083
500 to 600 registered tons	...	3	...	...	1	...	2	12	18	3,384	6,576	9,960	282	5,905
600 to 800 registered tons	1	14	3	...	...	...	2	14	34	13,846	10,368	24,214	517	7,773
800 to 1,000 registered tons	...	15	...	...	...	...	...	32	47	13,713	29,285	42,998	976	21,803
1,000 to 1,200 registered tons	3	9	...	...	...	...	...	22	34	13,539	23,972	37,511	822	18,845
1,200 to 1,400 registered tons	4	17	...	...	...	...	...	33	54	27,356	42,658	70,014	1,461	33,973
1,400 to 1,600 registered tons	5	11	...	...	...	...	...	33	49	23,955	49,257	73,212	1,521	38,541
1,600 to 1,800 registered tons	21	1	...	...	...	...	...	25	47	37,074	42,415	79,489	1,445	33,836
1,800 to 2,000 registered tons	5	...	...	...	...	...	...	19	24	9,532	35,897	45,429	932	29,965
2,000 and more registered tons	4	15	...	...	...	...	...	95	114	48,931	281,792	330,723	5,813	214,574
Special class: from 200 to 250 registered tons	...	2	1	...	...	...	2	8	13	1,136	1,807	2,928	128	3,310
Total	43	94	16	3	12	33	97	392	690	...	...	...	...	446,013
Registered tonnage........tons	71,223	118,747	5,842	478	1,655	3,912	14,362	...	...	216,219	542,198	758,417	...	...
Regular crew..........number	1,021	1,814	137	22	75	128	306	...	...	3,503	12,107	...	15,610	...

Changes in the mercantile marine of Hamburg since 1845.

January 1—	Home port Hamburg.		Increase.						Decrease.					
			New-built ships.				Old ships bought in other countries.		Lost and condemned.		Torn down and cast away.		Sold.	
			Hamburg yards.		Other yards.									
	Ships	Registered tons.	Ships.	Tons.	Ships.	Tons.	Ships.	Tons.	Ships.	Tons.	Ships.	Tons.	Ships.	Tons.
1845	206	39.757	1	45	2	454	20	3,562	4	497	1	238	1	281
1850	286	61,540	4	801	17	5,184	35	7,027	5	1,022	2	238	9	2,034
1855	456	119,900	4	1,244	14	5,279	15	3,478	15	2,844	3	981	23	6,229
1860	483	140,146	6	1,449	26	8,530	23	4,664	24	3,904	....	....	28	8,469
1865	530	178,605	12	5,166	20	7,992	42	15,257	14	3,735	1	358	50	14,580
1870	473	191,131	4	2,329	6	3,782	14	6,300	18	5,794	2	407	38	12,845
1875	442	215.744	5	2,582	12	8,872	33	11,986	18	8,785	2	96	29	10,736
1880	496	245.709	8	5,661	7	4,224	29	8,882	17	6,943	2	260	30	12,994
1885	481	319,923	7	5,373	8	4,411	28	9,043	21	8,279	2	41	20	8,295
1890	537	464,782	19	21,400	51	63,928	43	27,346	20	15,164	4	271	39	23,792
1891	587	538,229	23	20,803	30	35,576	24	9.136	24	14,722	10	1,414	32	18,370
1892	598	569.238	11	12,363	22	30,214	24	13,476	18	12,724	1	69	31	21,318
1893	605	591,180	17	19,087	16	14,844	33	16,902	17	11,094	5	1,563	18	10,868
1894	631	618,488	9	18,593	22	45,317	29	17,341	23	19,018	5	1,244	19	15,774
1895	644	663,703	16	26,870	20	28,399	24	14,320	16	15,433	2	213	36	52,847
1896	650	664,799	11	16,580	24	46,498	32	21,640	9	5,120	4	98	31	64,163
1897	673	680,136	9	18,837	28	44,501	26	19,064	17	9,902	6	2,953	36	34,218
1898	677	715,465	16	32,199	32	32,989	42	46,850	15	14,225	13	2,153	49	52,708

Number of ocean vessels (home port Hamburg) from 1851.

Classification of ships.	Number of ships, including the tonnage, in the year—													
	1851-1860.		1861-1870.		1871-1880.		1881-1890.		1891-1896.		1897.		1898.	
	Ships.	Tonnage.	Ships.	Tonnage.	Ships.	Tonnage.	Ships.	Tonnage.	Ships.	Tonnage.	Ships.	Tonnage.	Ships.	Tonnage.
Frigates	52	29,641	54	42,421	35	32,606	32	38,549	43	67,215	45	73,276	43	71,223
Barks and schooner barks	144	46,419	220	78,037	179	80,720	132	86,035	104	102,438	89	100,366	94	118,747
Brigs	125	24,837	102	23,072	39	9,798	10	2,662	3	860	5	1,422	....	....
Schooner brigs and schooners	25	3,448	29	4,730	48	6,988	33	5,121	24	3,729	17	2,406	15	2,133
Three-mast schooners	49	5,521	43	7,696	15	4,381	23	7,065	19	5,510	14	4,427	16	5,842
Galeasses	15	1,122	5	501	5	317	9	498	5	317	4	258	7	409
Galiotes	9	756	8	814	7	416	10	927	19	2,700	26	3,873	26	3,503
Kuffs	13	721	10	641	26	1,052	46	1,881	72	7,556	100	14,488	97	14,362
Steamers	13	6,954	26	19,555	94	78,003	209	216,959	337	431,157	377	514,949	392	542,198
Total	445	119,419	497	177,467	448	214,281	504	359,697	626	621,482	677	715,465	690	758,417

HUGH PITCAIRN,
Consul.

HAMBURG, *October 19, 1899.*

HAMBURG: SUPPLEMENTARY.

Referring to my report of the 19th instant, I inclose herewith translation of a letter which I have received from Senator Burchard, chief of the bureau of foreign affairs of Hamburg, in answer to a request addressed to him by me for certain information relative to the report in question.

HUGH PITCAIRN,
Consul.

HAMBURG, *October 30, 1899.*

[Translation.]

BUREAU OF FOREIGN AFFAIRS,
Hamburg, October 25, 1899.

Honorable HUGH PITCAIRN,
United States Consul, Hamburg.

SIR: In reply to your esteemed favor of July 26 last, I have the honor to transmit herein inclosed a list of Hamburg's ships for the year 1899,* as well as a statistical extract and various information relative to Hamburg's commerce for the year 1898.* These inclosures contain valuable information as to the condition, extent, and importance of the merchant marine, as well as to the condition of the commerce of this city.

The merchant marine of Hamburg is supervised by the Deputation für Handel und Schiffahrt (Deputation for Commerce and Navigation); its composition and rights are set forth in paragraphs 2, 3, 5-10, as well as paragraph 24, number 6, of the revised law relative to the organization of the administration, dated November 2, 1896, a copy of which law I have the honor to transmit herewith.*

Besides the Deputation for Commerce and Navigation, the chamber of commerce of this city is active in behalf of the merchant marine. Both institutions occasionally make recommendations for the promotion of the merchant marine and the betterment of all matters connected therewith.

The Government of Hamburg exerts influence upon the merchant marine only in so far as this is required for the safety of navigation and the registry and survey of ships. Otherwise, the merchant marine stands under no control on the part of the Government of this State; on the contrary, the greatest possible liberty of movement is granted to Hamburg's shipowners and steamship companies.

Official reports on some matters concerning the merchant marine are contained in the published proceedings of the Senate and House of Burgesses, as well as in the publications of certain committees appointed by the said House of Burgesses.

Mail carriage by steamships and everything connected therewith is under the jurisdiction of the Empire, which also makes the necessary contracts as to subsidies and mail carriage. The contracts for subsidy allowances are printed in the official publications of imperial laws (Reichs Gesetzblatt).

In addition to the foregoing, I wish to call your attention to the fact that the information therein given exclusively refers to affairs of the Hamburg merchant marine, and not to such matters existing within the limits of your consular district which are outside of the jurisdiction of the State of Hamburg.

With assurances of the highest respect and esteem, I have, etc.,

BURCHARD.

---

*Transmitted to the Commissioner of Navigation.

ITALY.

MERCHANT MARINE.

The following ships were registered up to December 31, 1896, in the naval departments:

Description.	Number.	Net weight.
		Tons.
Sailing ships	6,002	527,554
Steamers	351	237,727
Total	6,353	765,281

In the year 1897, the following variations took place:

Description.	Sailing vessels.		Steamers.	
	Number.	Tons.	Number.	Tons.
Increase.				
Built in national shipyards	151	2,941	5	7,385
Built and bought abroad	41	23,528	2	2,459
Acquired from foreigners	....	....	30	29,655
Produced in harbor service	42	448	7	1,130
Derived from different causes and revision of registers	2	11	....	....
From ships already registered	....	280	....	171
Total	236	27,208	44	40,800
Decrease.				
Demolished	98	6,484	10	10,900
Wrecked	76	10,129	3	1,583
Disappeared at sea	2	147	....	....
Burned	1	902	....	....
Sold to foreigners	46	8,069	10	5,603
Handed over to harbor service and others	119	1,590	6	128
For different causes and revisions of registers	24	336	....	....
Ships already registered	....	278	....	496
Total	366	27,935	29	18,710

In sailing ships and steamers, there was an increase of 280 ships and 68,008 tons, and a decrease of 395 ships and 46,645 tons.

The situation of ships registered on the 31st of December, 1897, is therefore the following:

Description.	Number.	Net weight.
		Tons.
Sailing vessels	5,827	526,827
Steamers	366	259,817
Total	6,238	786,644

As compared with the year 1896, there is nevertheless a decrease in the sailing vessels of 130 and of 727 tons, and an increase in steamers of 15 and of 22,090 tons. Keeping in mind that the power of the steamers is treble that of the sailing vessels, there has been an increase in the power of the commercial steam and sail fleet corresponding to 65,543 tons of sailing vessels.

Of the steamers, 55 were of wood and 311 of iron or steel, with a total measurement of 414,703 tons gross and 259,817 net, 77,527 horsepower nominal and 287,170 indicated. Compared with the year 1896, there was an increase of 15 steamers of 35,012 tons gross and 22,090 tons net, and 1,439 nominal horsepower and 24,635 indicated horsepower.

SUPERVISION OF MERCHANT MARINE.

A superior board of merchant marine has been established by royal decree. This board is under the supervision of the Department of the Navy. All questions pertaining to merchant marine are submitted to the board.

The most recent provisions passed in favor of the merchant marine are covered by the laws of July, 1896 and 1898.

At every reunion of Parliament, some discussion takes place and recommendations in favor of improving the merchant marine are made. These, as a rule, are brought about by interested parties, who enlist for the purpose the services of their respective representatives in Parliament.

The Government has the right to call into service for auxiliary naval purposes, in case of war, subsidized ships of the merchant marine. Some of these are included already in the royal navy as auxiliaries. The establishment of subsidies to the merchant marine has also increased the efficiency of mail carriage by steamships.

Italy seems to have followed to a large extent the policy of Austria, whose merchant marine has acquired, owing to the encouraging policy of that country, a development out of proportion with its seaboard.

The chambers of commerce and boards of trade in the large shipping ports of the country have a permanent committee, before which any questions interesting the merchant marine are placed, and it is the duty of this committee to bring the questions before the proper authorities.

WAR VESSELS.

In the last thirty years, the building of war ships has become one of the great industries of the country. Italy has four national and three private important shipyards. The great development of the building of war ships has naturally cheapened the construction of merchant ships in Italy. However, the construction of the latter has not acquired that importance which the great seaboard of the country would have warranted. In fact, many of the sailing and steam vessels of the merchant marine have been, and are now, either built abroad or acquired from foreigners.

The great majority of the sailing and steam vessels are of small tonnage, and are used in the coasting trade of Italy or in the Mediterranean. Some of the steamers have large capacity and are used for long sea voyages to South America and to India.

Most of the Italian navy has been built at home, and Italian shipyards have also furnished war ships to some foreign countries. At present, the building of war ships has fallen off considerably, and, in order to keep their shops in activity, the private shipbuilders have added to their industry the manufacturing of railroad rolling stock.

NAVAL CONSTRUCTION.

The ships constructed in the shipyards of the State during the year 1897 were 161 in number, of a total of 17,430 tons gross weight and 11,458 tons net, and of the approximate value, including machines and tools, of 10,984,847 lire ($2,120,075). In 1896, the number of ships built was 186 of 10,530 tons gross and 6,606 tons net, and of the value of 7,315,370 lire ($1,411,866), a decrease for 1897 of 22 in the number of ships and an increase of 6,900 tons gross, 4,852 net, and of the value of 3,669,477 lire ($708,209). This increase is due to the steady, if slow, growth in the construction of steamers and their respective machinery on account of the law of July 23, 1896, favoring commercial marine.

Among the ships launched in 1897 are the following cruisers: The *Bascir* and *Adamastor*, constructed by Orlando Brothers, of Leghorn, the first for the Sultan of Morocco and the second for the Portuguese Government; and the steamers *Central America*, *City of Milan*, and *Savoy*, constructed by the firm N. Odero for the Italian steam navigation society La Veloce.

MATERIALS FOR SHIPBUILDING.

Materials for shipbuilding, such as plates and structural forms for steel vessels, are now manufactured in Italy; a very small amount is imported from foreign countries. This material, as well as the timber and lumber used for the building of ships in the shipyards of the country, is allowed to enter free of duty.

The current price of steel plates for the hulls of vessels is to-day from 24 to 28 francs per 100 kilograms ($4.63 to $5.40 per 220 pounds). The price may vary in accordance with the size of the plates desired.

WAGES.*

The weekly wages paid at shipyards are, according to the skill of the workmen, as follows:

Workmen.	Wages.	
	Lire.	
Pattern makers	36 to 45	$7.00 to $9.00
Riveters	26 to 48	5.00 to 9.60
Machinists	60 to 80	12.00 to 16.00
Joiners and painters	24 to 36	5.00 to 7.00
Furnace men	30 to 72	6.00 to 14.50
Sheet-iron workers	27 to 70	5.50 to 14.00
Plumbers	24 to 36	5.00 to 7.00
Iron or brass molders	24 to 90	5.00 to 18.00
Common laborers	12 to 18	2.50 to 3.50

These wages vary according to the location of the works; labor is cheaper in central and southern Italy than in the north.

The average monthly wages paid in the foreign trade on steam and sail vessels are as follows:

Class.	Wages.	
	Lire.	
Captains	350	$70
Chief officers	200	40
Second and third officers	200 to 250	$40 to 50
Boatswains and carpenters	80 to 90	16 to 18
Cooks	70 to 80	14 to 16
Quartermasters	60	12
Ordinary seamen	40	8
Chief engineer	350	70
Second engineer	250	50
Third and fourth engineers	150	30
Greasers and donkeyman	90	18
Firemen	80 to 85	16 to 17
Coal trimmers	60	12

These wages are intended for long sea voyages.

The wages on coasters are from 10 to 15 per cent less.

SHIPPING LAWS.

The Italian Government has done much to encourage both Italian shipping and shipbuilding, and a law was passed by the Chamber in the year 1896 fixing, for the next ten years, the rates of navigation subsidies and of bounties on shipbuilding.

Subsidies.—The following are the more important provisions of the last law:

A subsidy of 80 centimes (15.34 cents) per ton, gross tonnage, per 1,000 miles navigated, is granted for three years to all Italian-built steamers or foreign-built steamers registered in Italy before 1887, for voyages to and from ports beyond the Suez Canal and the Straits of Gibraltar. Steamers not passing through the canal or the straits will be subsidized at two-thirds of the above rates. The subsidy is to be reduced by 10 centimes (1.93 cents) every three years, and all payments will cease when the steamer is fifteen years old. Sailing ships are subsidized under similar conditions, except that the triennial reduction is fixed at 15 centimes (2.9 cents), and after the first nine years the rate remains constant at 20 centimes (3.86 cents) until the ship is twenty-one years old, when all payment will cease.

---

* In the reductions of lire to United States equivalents, in his wage tables, the consul-general has estimated the value of the lira at 20 cents. The exact value is 19.3 cents.

Construction bounties.—The regulations concerning bounties payable on ships built in Italy fix the amount at 77 lire ($14.86) per ton gross burden for iron and steel ships, and at 17½ lire ($3.38) for wooden vessels. On engines built in Italy, 12½ lire ($2.41) are allowed per indicated horsepower; on boilers, 9½ lire ($1.83) are allowed per quintal. Ships of war built for foreign countries receive no construction fee.

In view of the efforts of the Government to encourage Italian shipping, the long seaboard, and the necessity of shipping to the economical life of the country, the results are certainly far from satisfactory; and it is particularly remarkable that the tonnage of Italian steamers remains generally so low, while in other countries the tendency has been towards the employment of larger ships as more economical in working. It is sometimes asserted that taxation on the shipping industry is so heavy as to kill small enterprise, which, if unfettered, might grow and flourish; but, on the other hand, the Government can point to the large navigation subsidies, which for the past year are estimated to exceed 3,000,000 lire ($579,000). A further and perhaps more correct explanation of the unsatisfactory situation is that the bulk of the subsidies are paid to two or three companies, which by constant favor have established a sort of shipping monopoly and successfully use their influence to crush all possible rivals.

Under the provision of the law of the 23d of July, 1896, there were entered during the year 1897, in competition for bounties of navigation, 72 steamers of an aggregate gross tonnage of 175,013.

Out of these 72 ships, 3 were found not to be entitled to any premium whatever for noncompliance with the requirements of the law, while the other 69 received an aggregate sum of 2,044,339 lire ($394,557), distributed according to the tonnage and power of each ship.

The Italian Government also paid from January 1 to December 31, 1897, for construction bounties on ships built in Italy the sum of

124,973.97 lire ($20,260) and refunded to shipbuilders a drawback of 448,729.76 lire ($86,605) on duty paid upon imported materials used for the construction of said ships.

On the other hand, the Italian Government received, on account of commercial marine, for harbor duties and other marine taxes the sum of 6,915,301.80 lire ($1,334,653).

Ships composing the Italian navy on December 31, 1899.

	Number.
Battle ships:	
First class	14
Second class	5
Third class	6
Fourth class	5
Fifth class	9
Sixth class	15
Seventh class	2
Torpedo catchers in construction	9
Torpedo boats:	
First class	8
Second class	92
Third class	38
Fourth class	5
Subsidiary ships of first class of over 4,000 tons displacement	2
Subsidiary ships of second class of less than 4,000 but more than 2,500 tons displacement	8
Subsidiary ships of third class of less than 2,500 tons displacement but more than 1,000	13
Subsidiary ships of fourth class of less than 1,000 tons displacement	21

Ships for local use in the military ports.

Towboats	24
Steam ferries	11
Gunboats for lagoon service	5
Torpedo and steam launches	16

Auxiliary ships taken from the merchant marine.

Cruisers	8

These belong to the Compagnia Générale di Navigazione Italiana and to the Veloce.

I annex translation of a recent decree governing the merchant marine.

HECTOR DE CASTRO,
Consul-General.

ROME, *July 25, 1899.*

ROYAL DECREE IN SUBSTITUTION OF SOME OF THE ARTICLES OF THE DECREE APPOINTING A SUPERIOR BOARD OF MERCHANT MARINE, AUGUST 23, 1898.

ARTICLE 1. Articles 2, 3, 5, 7, of the royal decree of July, 1885, modified by another decree of December, 1889, whereby there was constituted at the Navy Department a superior board of merchant marine, are abrogated and substituted by the following articles:

ART. 2. The board shall give its opinion upon all questions referred to its examination by the members of marine, as properly entering into the attributions of this board and concerning the interests of navigators, fishermen, shipowners, marine policy, safety at sea, systematizing of the ports, execution of the marine sanitary service, transportation of emigrants by water, and, in general, the expansion of the national maritime commerce.

ART. 3. The superior council of the merchant marine is composed of nine members nominated by royal decree and six ordinary members exofficio and six extraordinary members.

Of the nine members of the board, one is taken by the members of the board of industry and commerce; four from among persons who by profession and experience are most competent in matters that may be referred to the examination of the board; two from among the presidents or the members of the chambers of commerce of the maritime regions; and two from among the presidents of the maritime associations of encouragement for the commercial and maritime development of the country.

These nine members will remain in office three years, and one-third may be reelected.

Within the first two years after the approval of the present rules, a drawing by lot will determine which ones of the members of the board terminate their term of service.

The ordinary members exofficio are:

(1) The director-general of merchant marine; (2) the director-general of the customs; (3) the chief director-general of the direction of commercial affairs at the Department of Foreign Affairs; (4) the chief director of the division of industry and commerce.

The extraordinary members who, acting exofficio, will be called upon to be present at the meetings where questions of their respective competence may be treated are:

(1) The director-general of the navy construction at the Navy Department; (2) a superior officer of the public works (service of hydraulic works); (3) a superior officer of post and telegraphs (mail service); (4) a director of the funds for invalids of the merchant marine; (5) the board is presided over by the Assistant Secretary for the Navy.

By our decree and upon the proposal of the board, there will be appointed from its members a vice-president for three years.

The board meets in ordinary session in November and in May of each year. It may also be called—two extraordinary sessions—at other times. The sessions are called by the president, who designates the matters to be dealt with and proposed by the Secretary of the Navy.

ART. 6. A committee composed of the president of the board and of two members of the same board (designated every year, one by royal decree and the other by election of the board), and of the director-general of the commercial marine, will meet during the interval between the ordinary sessions in order to give its opinion upon matters which may be submitted by the Secretary of the Navy, and to study and gather such information as the latter may think proper to entrust it with.

The secretary may, upon his own initiative and upon the proposition of the president, add temporarily to the committee for special affairs other members of the board and also persons not belonging to the board, who might be so designated by reason of their functions and of their special competency.

It is ordered that the present decree be sealed, etc.

NAPLES.

The Italian merchant marine is in a fairly prosperous condition and is steadily, though slowly, growing in importance. The Government taxes mercantile shipping as heavily as it does every other industry.

The Minister of Marine at Rome exercises a controlling authority over all Italian ships.

War and merchant ships are chiefly built at Castellamare di Stabia. My best information is to the effect that the building of war ships neither cheapens nor enhances cost of merchant vessels. The very low rate of wages (stated to me to range from 30 to 60 cents per day for mechanics—experts sometimes receiving $1) renders it possible for Italians to construct vessels more cheaply than almost any other nation, although iron and timber have to be imported.

The war ships are built in the Government navy-yards at Castellamare di Stabia, both by the Government and under private contract. The Government has approved the recommendation of the Italian Minister of Marine for building four new first-class battle ships. These will be given out to private contractors.

There are now in the course of construction at the navy-yard in Venice the *Ferruccio;* at Spezia, the battle ship *Regina Margherita;* at Castellamare di Stabia, the *Benedetto Brin*, the *Agordat*, and the *Coatit*—the last one being about ready to launch and the *Agordat* now receiving her armament.

At the Naples yard, they are finishing the war ship *Emmanuele Filiberto* and in the private shipyard Orlando, at Leghorn, they are building the *Varese*, and at the private arsenal at Sampierdarena the *Garibaldi*. The Government is also reported to have concluded a contract with the steel works at Terni for furnishing 5,000 tons of armor plates for the ships now building, and a further contract for 35,000 tons to complete said ships will be given out in the immediate future. At Naples, no ships are built, but only finished as to machinery and equipments.

Wages on Italian merchant vessels vary largely, there being no uniform rate. A separate and private bargain is made with each man, secrecy as to what is paid being enjoined.

A report prepared by the British consulate's special expert is herein inclosed,* as containing many matters of interest not mentioned in the Department's circular.

A. H. BYINGTON,
Consul.

NAPLES, *October 23, 1899.*

---

* Transmitted to the Commissioner of Navigation.

NETHERLANDS.

CONDITION OF MERCHANT MARINE.

The merchant marine of the Netherlands has comprised the following tonnage on the 1st of January of each year from 1859 to 1899, a period of forty-one years:

Year.	Tonnage (new measurement).	Year.	Tonnage (new measurement).	Year.	Tonnage (new measurement).
1859	418,136	1873	325,925	1887	319,203
1860	399,758	1874	333,252	1888	309,655
1861	383,847	1875	353,849	1889	315,097
1862	376,054	1876	348,209	1890	371,315
1863	368,929	1877	359,371	1891	345,045
1864	360,322	1878	364,368	1892	378,888
1865	364,896	1879	377,314	1893	378,103
1866	367,214	1880	354,356	1894	380,123
1867	365,550	1881	341,013	1895	384,056
1868	350,708	1882	343,384	1896	386,187
1869	345,965	1883	355,190	1897	373,387
1870	344,828	1884	347,257	1898	362,893
1871	345,787	1885	348,808	1899	374,213
1872	337,201	1886	350,094		

Of the 578 ships, measuring 374,213 tons, owned in the Netherlands on January 1 of this year, 89 of a tonnage of 138,254 tons belonged to Amsterdam, 158 of a tonnage of 53,018 tons to Groningen, 113 of a tonnage of 167,446 to Rotterdam, and 10 of a tonnage of 15,495 to Vlissingen (Flushing). Of these vessels, 169 were steamers, 262 small coasting and Baltic boats, 26 small sailing craft, 71 schooners and schooner brigs, 1 brig, 35 barks, and 12 four-masters and frigates.

During the year 1898, 57 ships of a tonnage of 36,861 tons were taken out of the trade and 62 ships of 63,495 tons added, making a net gain of 5 ships measuring 26,634 tons. Of the 57 ships, 29 were sold, 13 stranded, and 6 sunk. Seventeen of the craft taken out of trade were steamers.

On January 1, 1899, there were owned in the Dutch East Indies 249 ships of a tonnage of 83,305 tons, of which 76 were steamships, 4 small sailing vessels (kotters, luggers, etc.), 124 schooners and schooner brigs, 8 brigs, 36 barks, and 1 three-master. Of these vessels, 39 of a tonnage of 4,227 were owned at Bandjermassin, 57 of a tonnage of 56,303 tons at Batavia, 29 of a tonnage of 8,125 tons at Sœrabaya, and 15 of a tonnage of 3,754 tons at Palembang.

At the same date, the Dutch fleet owned in the West Indies and Dutch Guiana was:

Port.	Ships.	Tonnage.
Aruba	7	156
Bonaire	3	151
Curaçao	24	939
Nickerie	4	68
Paramaribo	2	63
Saba	4	129
St. Eustatius	2	30
St. Martin	11	708
Total	57	2,244

Of these, 1 was a steamer, 3 were small sailing vessels, 32 schooners and schooner brigs, and 21 barks.

On January 1, 1899, the following shipping at home and abroad was being built for Hollanders' account: At Altblasserdam, by Jan Smit & Co., for the Stoomvaart de Maatschappij, 2 steamers of about 3,750 gross tons, keel laid in 1898; at Amsterdam, by Nederlandsche Scheepvaart Maatschappij, for the Koninklijke Paketvaart Maatschappij te Amsterdam, the *Parra* of 600 tons, keel laid in 1898; by the same company, for the Stoomvaart Maatschappij Nederlandsch, the *Soembawa* of 3,400 tons, the *Timor* of 5,000 tons, the *Flores* of 5,000 tons, keels laid in 1898; and for the Oostzee Company, the *Heelsum* of 1,430 tons, keel laid in 1898. At Belfast, the twin-screw steamers for the Holland-America Line, by Harland & Wolff, the *Noordam* and *Rijndam*, each of 12,500 tons, the keel of the former laid in 1898, the latter in 1897; at Greenoch, by Carmichael, McLean & Co., the *Eemstroom* of 1,100 tons, for the Hollandsche Stoomboot Maatschappij te Amsterdam and the *Bali* of 3,400 tons for the Stoomvaart Maatschappij Nederland, keels laid in 1898; at Hamburg, by Blohm & Voss, the *Potsdam* of 12,500 tons, for the Holland-America Line, keel laid in 1898; at Hartlepool, by William Gray & Co., the *Beta* of 2,500 tons, for the Vracht Maatschappij, Bothnia te Amsterdam, keel laid in 1898; at Hoogezand, by Boon, Molema & de Cock for J. Mulder, Groningen, the N. N. of 320 tons, keel laid in 1898; N. N. by J. & K. Smit, for J. den Olden, Veendam Tjalk of 180 tons, keel laid in 1898; by J. & K. Smit, for R. Groenemeld, Delfzijl and Tjalher, the *Eems Wezer* of 130 tons, keel laid in 1898; at Martenshock, by W. Boerma Wzu for P. Vellinga, Groningen Tjalk, N. N. of 145 tons, keel laid in 1898; at Newcastle-on-Tyne, by W. Richardson & Son for the Rotterdamsche Lloyd, Rotterdam, the *Solo* of 5,000 tons, keel laid in 1898; at Rotterdam, by Rijkee & Co. for the Koninklijke Nederlandsch Stoomboot Maatschappij, Amsterdam, the *Helena* of 1,500 tons, keel laid in 1897; by de Werf van Rijkee & Co., N. N. of 2,000 tons, keel laid in 1899, for the Koninklijke West Indian Maildienst, Amsterdam; the *Mossel*, 2,100 tons, keel laid in 1898, by Werkt van Fijenoord for the Koninklijke Paketvaart Maatschappij; the *Koning Willem II* of 4,500 tons, keel laid in 1898, by Werkt van Fijenoord for the Stoomvaart Maatschappij Nederland; at Sunderland, by William Doxford & Sons for William H. Müller & Co., Rotterdam, the *Skandia* of 7,500 tons, keel laid in 1898; at Vlissingen, by Koninklijke Maatschappij de Schelde for Stoomvaart Maatschappij, Amsterdam, the *Koning Willem III* of 4,500 tons, keel laid in 1898; and by same firm, for the Rotterdamsche Lloyd, Rotterdam, the *Sindoro* of 4,900 tons, keel laid in 1898; at Waterhuizen, by J. van Diepen, jr., for Th. Huheman, Wildervank Tjalk, N. N., 140 tons, keel laid in 1898; the N. N., 120 tons, keel laid in 1898, by same firm for K. Hontstra, Oosterwolde.

Summing up, we have the total of Holland shipping being built in 1899 of 21 steamships of 99,430 gross tons, 1 three-master of 320 gross tons, 6 sailboats of 845 gross tons, making a total of 28 ships, measuring 100,595 gross tons.

The total shipping under the Netherlands flag on January 1, 1899, was:

In—	Ships.	Tons (new measurement).
Netherlands	578	374,213
Netherlands East Indies	249	83,305
Netherlands West Indies	57	2,244
Total	884	459,762

GOVERNMENT POLICY.

The secretary of the Chamber of Commerce of Amsterdam (Kamer van Koophandel en Fabrieken te Amsterdam), in a letter to the writer under date of September 2, 1899, says:

> The Netherlands Government may be said to abstain from any specific policy to promote the merchant marine. The work of the Government in behalf of the merchant marine is almost entirely limited to police regulations, viz, issuing sea letters, measurement of ships, examinations of ship captains and officers, supervision of same by a council of discipline, etc.

The merchant marine is under the supervision of the Department of Public Works, Trade, and Industry. The head of this department is a cabinet officer, must be an engineer by profession, and is, by reason of Holland's topography and international situation, a very important functionary.

The secretary of the chamber of commerce, Mr. A. J. Cohen Stuart, says further:

A Parliamentary committee held an inquiry into the condition of the merchant marine in the years 1874 and 1895, and recommended the abolishment of impediments to the free development of shipping, at the time consisting of pilot charges, buoy and other dues; further, amelioration of water ways and harbors—many of which measures have since, indeed, been adopted. It must be observed, however, that these measures tend equally to the profit of vessels under foreign flags entering our harbors. The only distinctively protective measure in regard to our own merchant marine, and especially the shipbuilding industry, is a clause in a contract of recent years between the Government and the Netherlands India Packet Company, stating that the company should have its steamers built in Holland if reasonable conditions could be obtained. As almost everybody, especially in shipping circles, is content with the maintenance of the free-trading principle in the merchant marine, discussions of the nature referred to are very rare here.

WAR SHIPS.

The vice-admiral and commander of the royal Dutch navy, in a letter addressed to this office, Amsterdam, August 15, 1899, says:

> As to the effect of the building of war ships upon the cost of constructing merchant ships in this country, I can not possibly give you any information.

The admiral states that this "probably may be obtained from the director of private naval yards." Steps have been taken to obtain the information from the sources indicated, but replies to urgent letters to that end are not at the moment at hand. If received, their contents will be transmitted as a supplementary report. The following list of war ships built since the year 1894 was sent by this official:

LIST OF WAR SHIPS BUILT IN THE NETHERLANDS SINCE 1894.

Government dockyard, Amsterdam (*Rijkswerf te Amsterdam*).—An armored vessel of 3,500 tons displacement, 4,700 horsepower, and 16 knots speed was launched in 1894 and completed in 1896. A protected cruiser of 3,900 tons displacement, 10,000 horsepower, and 20 knots speed was launched in 1896 and completed in 1898. Another protected cruiser of the same type was launched in 1898 and completed in 1899. An armored vessel of 4,950 tons displacement, 6,000 horsepower, and 16 knots speed has been laid down in 1898.

Private dockyard, Flushing (*firm Koninklijke Maatschappij de Schelde te Vlissingen*).—An armored vessel of 3,500 tons displacement, 4,700 horsepower, and 16 knots speed was launched in 1894 and completed in 1896. A protected cruiser of 3,900 tons displacement, 10,000 horsepower, and 20 knots speed was launched in 1897 and completed in 1898. Another protected cruiser of the same type was launched in 1897 and completed in 1899. Two unprotected cruisers of 820 tons displacement, 1,290 horsepower, and 13 knots speed were launched in 1896 and completed in 1897.

Private dockyard, Rotterdam (*firm Nederlandsche Stoomboot Maatschappij te Tijenoord*).—An armored vessel of 3,500 tons displacement, 4,700 horsepower, and 16 knots speed was launched in 1894 and completed in 1896. A protected cruiser of 3,900 tons displacement, 10,000 horsepower, and 20 knots speed was launched in 1896 and completed in 1898. Another protected cruiser of the same type was launched in 1897 and completed in 1899. An armored vessel of 4,950 tons displacement, 6,000 horsepower, and 16 knots speed has been laid down in 1899.

Private dockyard, Amsterdam (*firm Thijgens en van Gelder, Amsterdam*).—One unprotected cruiser of 820 tons displacement, 1,300 horsepower, and 13 knots speed was launched in 1894 and completed in 1895. Another unprotected cruiser of the same type was launched in 1895 and completed in 1896.

Private dockyard, Amsterdam (*firm Nederlandsche Stoomboot Maatschappij te Amsterdam*).—Two unprotected cruisers of 790 tons displacement, 1,400 horsepower, and 13.5 knots speed were launched in 1897 and completed in 1898.

MATERIALS FOR SHIPBUILDING.

Steel and iron are imported from England and Germany. Teak wood is imported from West Indies, djati wood from East Indies. Other sorts of timber and lumber are imported principally from Norway, Sweden, and Russia. Pine comes mostly from America.

Prices of steel plates for the hulls of vessels are at present 9.25 to 9.50 florins ($3.26 to $3.80) per 100 kilograms (220 pounds); they are, however, rising.

WAGES.

The average hourly wages paid in shipyards are:

Workmen.	Wages.	
	Dutch cents.	*U. S. cents.*
Ship carpenters	22 to 25	8⅘ to 10
Joiners and pattern makers	22	8⅘
Riveters	19	7⅗
Painters	18	7⅕
Riggers	25	10
Sheet-iron workers	16 to 20	6⅖ to 8
Laborers	16 to 17	6⅖ to 6⅘

As all work in shipyards, so far as possible, is given out by contract, the workmen receive, on an average, 20 per cent higher wages.

Average monthly wages paid at this port in the foreign trade.

Class.	Wages.	
Steam Navigation Company Nederland (*steamer line to Dutch East Indies*).	*Florins.*	
First mate	150 to 200	$60.00 to $80.00
Second mate	90 to 100	36.00 to 40.00
Third mate	60 to 70	24.00 to 28.00
Fourth mate	40 to 50	16.00 to 20.00
First engineer	200 to 300	80.00 to 120.00
Second engineer	135 to 170	54.00 to 68.00
Third engineer	90 to 100	36.00 to 40.00
Fourth engineer	60 to 70	24.00 to 28.00
Assistant engineer	25 to 50	10.00 to 20.00
Boatswain	55	22.00
Boat's mate	42	16.80
Carpenter	60	24.00
Quartermaster	38 to 40	15.20 to 16.00
Able seaman	30	12.00
Boiler maker	50	20.00
Donkey man	40	16.00
Oiler	40	16.00
Fireman	38 to 40	15.20 to 16.00
Coal passer	25	10.00

Average monthly wages paid at this port in the foreign trade—Continued.

Class.	Wages.	
Steamer Company Ocean (freight steamer line to East Indies).	*Florins.*	
First mate	144	$57.60
Second mate	120	48.00
Third mate	63 to 84	$25.20 to 33.60
First engineer	216 to 240	86.40 to 96.00
Second engineer	130 to 156	52.00 to 62.40
Third engineer	70 to 100	28.00 to 40.00
Fourth engineer	60 to 70	24.00 to 28.00
Boatswain	58	23.20
Carpenter	63	25.20
Quartermaster	38	15.20
Able seaman	35	14.00
Fireman	40	16.00
Coal passer	33	13.20
Holland-America Line.		
First mate	100	40.00
Second mate	70	28.00
Third mate	40 to 50	16.00 to 20.00
Fourth mate	30 to 40	12.00 to 16.00
First engineer	160 to 220	64.00 to 88.00
Second engineer	100 to 110	40.00 to 44.00
Third engineer	70	28.00
Fourth engineer	40	16.00
Assistant engineer	30	12.00
Boatswain	60	24.00
Boat's mate	44	17.60
Carpenter	60	24.00
Quartermaster	40	16.00
Able seaman	36	14.40
Boiler maker	50	20.00
Donkey man	47	18.80
Oiler	42	16.80
Fireman	40	16.00
Coal passer	30	12.00
Royal Netherland Steamer Company (steam line, freight, to Baltic and Mediterranean ports).		
First mate	65 to 75	26.00 to 30.00
Second mate	45 to 55	18.00 to 22.00
Third mate	40	16.00
First engineer	70 to 120	28.00 to 48.00
Second engineer	50 to 60	20.00 to 24.00
Third engineer	40	16.00
Assistant engineer	36 to 40	14.40 to 16.00
Carpenter	45	18.00
Quartermaster	35	14.00
Able seaman	30	12.00
Donkey man	35	14.00
Fireman	30	12.00
Coal passer	25	10.00
American Petroleum Company.		
First officer	144	57.60
Second officer	96	38.40
Third officer	60	24.00
Boatswain	48	19.20
First engineer	240	96.00
Second engineer	144	57.60
Third engineer	120	48.00
Fourth engineer	72	28.80
Steward	48	19.20

Average monthly wages paid at this port in the foreign trade—Continued.

Class.	Wages.	
American Petroleum Company—Continued.	*Florins.*	
Second steward	30	$12.00
Cook	60	24.00
Cook's mate	24	9.60
Able seaman	36	14.40
Donkey man	45	18.00
Fireman	40	16.00
Carpenter	60	24.00
British steamers and sailing vessels.	*£ s.*	
First officer	9 0	43.80
Second officer	7 0	34.06
Third officer	5 0	24.33
Chief engineer	18 0	87.60
Second engineer	12 0	58.40
Third engineer	8 0	38.93
Fourth engineer	6 0	29.20
Boatswain	5 0	24.33
Able seaman	3 10	17.03
Donkey man	5 0	24.33
Fireman	3 15	18.24
Ordinary seaman	2 10	12.16
Mess-room steward	2 0	9.73
Steward	6 0	29.20
Cook	5 0	24.33
Norwegian ships.	*Crowns.*	
First engineer	250	67.00
Second engineer	180	48.24
Third engineer	150	40.20
First officer	190	50.92
Second officer	150	40.20
Seaman	55	14.74
Fireman	55	14.74

STEAMSHIP LINES.

The Holland-American Steamship Company (Nederlandsch-Amerikaanische Stoomvaart Maatschappij) was organized April 18, 1873. The headquarters are at Rotterdam, and the company is incorporated for a period ending December 31, 1923. The original capital was 4,000,000 guilders ($1,608,000), which was raised to 8,000,000 guilders ($3,216,000) in 1898, divided into thirty-two series, each of 250,000 guilders ($100,500) in shares of 500 guilders ($210) each. Of this, half has been placed and the remainder must be placed by December 31, 1908. Fourteen hundred shares were given to the initiators of the company. In the year 1888, 4½ per cent bonds were issued to the amount of 1,300,000 guilders ($522,600), of which 665,000 guilders ($267,330) are in circulation; in 1890, 4 per cent bonds to the amount of 1,500,000 guilders ($603,000) were issued, of which 1,200,000 guilders ($482,400) are now in circulation.

Of the profits, shareholders receive 5 per cent on the capital: of the remainder, 12½ per cent goes to the directorate; con receive 2½ per cent; initiators, 5 per cent; and shareholders, 80 per cent.

The fleet consists of the *Amsterdam*, 3,629 tons gross; *Maasdam*, 3,984 tons; *Spaarndam*, 4,539 tons; *Statendam*, 10,320 tons; *Rotterdam*, 8,302 tons; and the *Werhendam*, of 3,639 tons. The *Noordam*, *Pottsdam*,* and *Rijndam*, each of 12,500 tons, are now building at the yards of Harland & Wolff, at Belfast, from which the *Statendam* was launched and completed, so as to make her maiden voyage in August of 1898. Dividends have been, from 1874 to 1898:

Year.	Rate.	Year.	Rate.
	Per cent.		*Per cent.*
1874	2.995	1887	0
1875	0	1888	11
1876	0	1889	17
1877	0	1890	0
1878	5	1891	0
1879	5	1892	0
1880	10	1893	0
1881	9	1894	0
1882	0	1895	0
1883	0	1896	0
1884	0	1897	0
1885	0	1898	6
1886	0		

The balance sheet of the company on December 31, 1898, was as follows:

Debit.			Credit.		
	Guilders.			*Guilders.*	
Material	4,784,001	$1,923,168	Capital	4,000,000	$1,608,000
Steamships in construction	954,784	383,824	Bonds of 1888	571,133	229,595
Establishment at Wilhelminakade	124,000	48,848	Bonds of 1890	1,157,667	465,382
Cash on hand	86,010	34,576	Repairs and boilers	600,000	241,200
Cash on deposit	180,000	72,360	Insurance fund	107,714	43,305
Bonds in office	213	86	Fund for benefit of personnel	117,367	47,182
Stocks	508,241	204,313	Sundry credits	689,710	277,263
Prepaid insurance	113,151	45,487	Dividend (1898) and taxes	246,000	98,892
Fitting up steamers, current voyages	36,383	14,626	Profit and loss account	5,268	2,118
Furniture	3,000	1,206			
Sundry debits	700,076	281,431			
Total	7,489,859	3,010,925	Total	7,489,859	3,010,925

The shares of the company were quoted on September 7, 1899, on the Amsterdam exchange, at 99.

---

* Blohm & Voss, Hamburg.

The Netherlands Steamship Company (Stoomvaart Maatschappij Nederland) was organized on May 13, 1870, incorporated for fifty years, with headquarters at Amsterdam. Its capital is 7,000,000 guilders ($2,814,000), divided into seven thousand shares of 1,000 guilders ($402) each, which are subdivided into shares of 500 guilders ($201). These securities were divided into two series, of which one-half, amounting to 3,500,000 guilders ($1,407,000), were at once placed. Of the second series, there was placed on December 31, 1897, 1,851,500 guilders ($744,303), and the remainder, offered on April 18, 1898, at the rate of 138 per cent, has been nearly all taken up.

The company issued 5 per cent bonds in 1872 to the amount of 3,500,000 guilders ($1,407,000). This emission was entirely liquidated on July 1, 1898. The 4½ per cent debentures of 1879, to the amount of 1,000,000 guilders ($402,000), have also been retired. Of the 4 per cent debentures of 1881, amounting to 2,000,000 guilders ($804,000), there had been paid off on December 31, 1897, the amount of 1,058,000 guilders ($425,316). By resolution of May 6, 1891, an emission of 2,000,000 guilders ($804,000) was authorized in order to enable the company to enter into a new Government mail contract, but up to date no use has been made of its powers in this direction by the board.

The distribution of profits has been regulated as follows: Five per cent is written off for depreciation, and 5 per cent of the capital stock is distributed to the shareholders; 10 per cent is then carried to the reserve fund, 10 per cent awarded to the directorate, 15 per cent to the commissaries, 5 per cent to the pension fund, and the remaining 60 per cent divided among the shareholders. The dividends, which are declared in May, have been, from 1871 to 1897:

Year.	Rate.	Year.	Rate.
	Per cent.		*Per cent.*
1871	0	1885	4
1872	0	1886	0
1873	0	1887	6
1874	5	1888	10
1875	5	1889	10
1876	5	1890	9·7
1877	7	1891	7·3
1878	2.5	1892	7·4
1879	4·5	1893	9
1880	8.5	1894	10
1881	9	1895	9·5
1882	6.2	1896	7·7
1883	2.6	1897	11·5
1884	0		

The fleet consists of sixteen ships, as follows:

Name.	Gross tonnage.	Name.	Gross tonnage.
Burgemeester den Tex	3,000	Prins Hendrik	3,600
Java	2,800	Prinses Marie	2,800
Koningin Regentes	3,800	Prins van Oranje	3,000
Koningin Wilhelmina	4,200	Prinses Sophie	3,600
Lombok	2,600	Soenda	2,300
Madura	3,400	Sumatra	2,600
Prins Alexander	3,000	Voorwarts	2,800
Prinses Amalia	3,500	Koning Willem I	4,400

The balance sheet of the company on December 31, 1897, was:

Debit.			Credit.		
	Guilders.			*Guilders.*	
Shares of the second series in possession of the company	1,648,500	$662,697	Capital	7,000,000	$2,814,000
Cash on hand	23,674	9,517	Bonds, issue of 1872	6,500	2,613
Bills of exchange in company's office	57,143	22,971	Bonds, issue of 1881	1,058,000	425,316
Money loaned and on deposit	1,780,000	715,560	Sundry credits	316,974	127,424
Houses and real estate	70,000	28,140	Repair account	71,669	28,811
Furniture	1	....	Dividends not declared	8,478	3,409
Establishments at Amsterdam	93,490	37,583	Bonds and coupons of emissions not issued	6,180	2,484
Repair shops at Amsterdam	13,159	5,290	Freight and passenger fares on current voyages	851,963	342,489
Steamships of the company	4,531,000	1,821,462	Insurance reserve account	900,000	361,800
Inventory of same	104,492	42,006	Reserve fund	552,967	222,293
Steamers in construction	631,748	253,963	Fund for support, personnel	354,120	142,356
Expenses of current voyages	424,313	170,574	Premium account for officers	16,289	6,548
Wages of crew, current voyages	113,591	45,664	Depreciation account	400,000	160,800
Annual insurance account	131,391	52,819	Profit and loss account	1,366	549
Warehouse account	323,837	130,182	Dividend account	774,727	311,520
Coal account	513,337	206,361	Insurance (self)	52,645	21,163
Stocks and bonds	712,218	286,312			
Reserve fund	480,357	193,103			
Supporting fund	344,564	134,495			
Premium fund for officers	16,645	6,691			
Sundry debits	368,618	148,184			
Total	12,372,078	4,973,575	Total	12,372,078	4,973,575

It will be noted that the company has its own insurance department.

The shares of the company were quoted on the Amsterdam exchange September 7, 1899, at 174.

The Royal Netherlands Steamship Company (Koninklijke Nederlandsche Stoomboot Maatschappij), which controls lines running to

Baltic and Mediterranean ports, was organized October 1, 1856, with headquarters at Amsterdam, and incorporated for a period that expires December 31, 1919.

In 1879, the nominal value of shares (then 1,000 guilders=$402) was cut in half, and in 1882 the nominal capital was increased to 5,000,000 guilders ($2,010,000), divided into ten thousand shares, each of 500 guilders ($201) or two shares of 250 guilders ($100.50) each. Of these, there was placed 1,688,250 guilders ($678,677). By July 1, 1899, the entire capital must have been placed.

Four per cent bonds were issued in 1886 to the amount of 2,500,000 guilders ($1,005,000); of these, there are now outstanding 1,133,000 guilders ($455,466).

At the end of the year 1897, the fleet consisted of 28 steamers, to wit:

Name.	Tonnage.	Name.	Tonnage.
Castor	2,000	Mercurius	1,000
Pollux	1,750	Minerva	1,000
Stella	1,750	Aurora	1,000
Penelope	1,700	Nereus	1,000
Hebe	1,500	Pomona	900
Iris	1,500	Berenice	800
Danae	1,500	Flora	800
Leda	1,500	Sirius	750
Titan	1,250	Etna	650
Saturnus	1,050	Clio	600
Oberon	1,050	Orion	600
Ceres	1,000	Ondine	400
Juno	1,000	Rembrandt	300
Mars	1,000	Urania	300

The cargo capacity of the fleet is 29,650 tons; number of voyages in 1897, 280; merchandise carried in said year, 347,994 tons; freight, 2,565,932 guilders ($1,031,504).

The following annual dividends have been paid:

Year.	Rate.	Year.	Rate.	Year.	Rate.
	Per ct.		*Per ct.*		*Per ct.*
1857	3.25	1871	11.5	1885	0
1858	3.5	1872	7	1886	2
1859	4	1873	10	1887	5
1860	3.5	1874	5	1888	10
1861	7	1875	0	1889	12
1862	4.5	1876	0	1890	9
1863	5	1877	0	1891	6
1864	10	1878	0	1892	6
1865	6	1879	2	1893	8
1866	8	1880	5	1894	8
1367	5	1881	9	1895	8
1868	5	1882	2	1896	8
1869	8	1883	5	1897	9
1870	8	1884	0		

The balance sheet on December 31, 1897, was:

Debit.			Credit.		
	Guilders.			*Guilders.*	
Steamers	1,989,620	$799,827	Capital subscribed	1,688,250	$678,676
Lighter ship	2,000	804	Issue in circulation	1,133,000	455,466
Sheds	1		Insurance fund	325,000	130,650
Office building	40,000	16,080	Dividend account	176,745	71,051
Furniture	1		Bonds due	83,200	33,446
Machinery, etc	33,252	13,367	Coupons of same	24,788	9,965
Insurance fund	293,688	118,063	Exchange account	8,212	3,310
Exchange account	1,927	775	Sundry credits	250,611	100,746
Remittance account	6,796	2,742	Profit and loss balance	2,294	922
Cash on hand	131,291	52,779			
Money on deposit	512,772	206,134			
Sinking fund	140,000	56,280			
Sundry debits	540,752	217,382			
Total	3,692,099	1,484,233	Total	3,692,099	1,484,233

The shares of the company were quoted on the Amsterdam exchange on October 5, 1899, at 149¾.

The Netherlands Ocean Steamship Company (De Nederlandsche Stoomvaart Maatschappij "Oceaan") was organized August 13, 1891, and incorporated for a term of years ending December 31, 1915; headquarters, Amsterdam. The capital of the company is 2,000,000 guilders ($804,000), divided into two thousand shares and all placed. Dividends 1892–1897 were:

	Per cent.
1892	0
1893	1.95
1894	10.18
1895	1.65
1896	0
1897	0

The fleet consisted on January 1, 1899, of the following steamships:

Name.	Gross tonnage.	Name.	Gross tonnage.
Agamemnon	2,291	Telamon	2,292
Anchises	2,729	Telemachus	2,082
Cyclops	2,064	Tencer	2,846
Laërtes	2,097	Titan	2,285
Polyhemus	2,871		

The Royal West Indian Mail (Koninklijke West-Indian Maildienst) was organized August 15, 1882, incorporated for fifty years, headquarters at Amsterdam. The capital is 2,000,000 guilders ($804,000), divided into two thousand shares of 1,000 guilders ($402), and these split into shares of 500 guilders ($201) each. Of the stock, 1,546,000 guilders ($621,492) has been placed, and all must be placed by May 31, 1900.

Of the 5 per cent loan of 1883, all the issues have been taken up. A loan of 4 per cent bonds was launched in 1889, to be redeemed in twenty-year drawings, beginning with 1891. Of this issue of 1,200,000 guilders ($484,200), there is outstanding 878,000 guilders ($352,956). Coupons are due February 1 and August 1. The fleet consists of eight steamships. The first voyage was made March 27, 1884. In 1897, nineteen round voyages were made.

Dividends, 1884–1897.

Year.	Rate.	Year.	Rate.
	Per ct.		*Per ct.*
1884	0	1891	2.5
1885	0	1892	3
1886	0	1893	8
1887	3.5	1894	8
1888	5	1895	8
1889	6.5	1896	8.5
1890	2	1897	6.5

The balance sheet on December 31, 1897, was:

Debit.			Credit.		
	Guilders.			*Guilders.*	
Shares not placed	54,000	$21,708	Capital	1,600,000	$643,200
Reserve fund	78,205	31,438	Bonds	878,000	352,956
Personnel pension fund	21,475	8,633	Interest account	14,633	5,883
Insurance fund	230,072	92,489	Unclaimed coupons	560	225
Cash	9,500	3,819	Unclaimed dividends	2,005	806
Stock account	16,630	6,685	Reserve fund	89,341	35,915
Remittance account	22,179	8,916	Supporting fund (personnel)	24,291	9,765
Money loaned or on deposit	100,500	40,401	Insurance fund	230,340	92,597
Steamers	2,140,000	860,280	Bill of exchange account	12,548	5,044
Lighters	7,000	2,814	Exploitation account, warehouses	501	201
Inventory of steamers	88,000	35,376	Premium account of officers	5,547	2,230
Office building	40,000	16,080	Account for subsidy carriage of mails	1	....
Establishment at Amsterdam	7,000	2,814	Freight and passenger money, current voyages	202,233	81,298
Establishment at Paramaribo	90,000	36,180	Credits	130,656	52,524
Do	1	....	Dividend account	100,490	40,397
Supplies in warehouse	25,206	10,133	Taxes	2,327	935
Coal account	3,668	1,475	Profit and loss account	1,032	415
Office furniture	1,000	402			
Warehouses at Paramaribo	1,100	442			
Insurance account	53,383	21,460			
Debits	76,936	30,928			
Expenses, current voyages	228,650	91,917			
Total	3,294,505	1,324,391	Total	3,294,505	1,324,391

The fleet consisted on January 1, 1899, of the following steamers:

	Gross tonnage.
Oranje Nassau	1,304
Prins Frederik Hendrik	1,642
Prins Maurits	1,310
Prins Willem I	1,723
Prins Willem II	1,641
Prins Willem III	1,682
Prins Willem IV	1,720
Prins Willem V	1,825

The shares of the company were quoted on October 5, 1899, on the Amsterdam exchange, at 119¼.

The Baltic Steamship Company (Stoomvaart Maatschappij Oostzee) was organized February 10, 1897, and incorporated for a term of years that expires December 31, 1926; headquarters at Amsterdam. The original capital was 500,000 guilders ($201,000), which was increased by 500,000 guilders ($201,000) when the new steamships now building were authorized. The original steamers were the following:

	Gross tonnage.
Bussum (lost May, 1898)	(*)
Hilversum	1,432
Leersum	1,484
Heelsum	1,500

The *Ootmarsum*, of 2,100 tons, and the *Loppersum*, of 1,800 tons, are now building at West Hartlepool, England, by William Grey & Co.

The dividend for seven months of 1897 was 4½ per cent, and for 1898 it was 6 per cent, while 32,000 guilders ($12,864) have been carried to the reserve fund. The stock, which has all been placed in shares of 500 to 1,000 guilders ($201 to $402), is quoted at 119 to 120, and has been 125.

The Holland Steamship Company (Hollandsche Stoomboot Maatschappij), whose ships ply between Dutch and English ports, was organized January 31, 1885, and incorporated for a term of years ending December 31, 1915; headquarters at Amsterdam. The capital is 600,000 guilders ($241,200), divided into six hundred shares, all placed and paid up.

In August, 1895, there were issued 5 per cent bonds to the amount of 250,000 guilders ($100,500), of which ninety-one bonds of 1,000 guilders ($402) each are not issued; drawn, 21,000 guilders ($8,442).

Dividends, 1885–1893, none; 1894–96, 5 per cent; 1897, 9 per cent.

---

* Not ascertained.

The fleet consisted on January 1, 1899, of the following steamers:

	Gross tonnage.
Amstelstroom	801
Rijnstroom	877
Ijstroom	1,017
Zaanstroom	990

The shares of the company were quoted on the Amsterdam exchange October 5, 1899, at 133.

The American Petroleum Company (Amerikaanische Petroleum Maatschappij) was organized March 11, 1891, and was incorporated for a period that expires December 31, 1920; headquarters at Rotterdam, with branch office at Antwerp. The capital originally was 5,000,000 guilders ($2,010,000), which was increased to 6,250,000 guilders ($2,512,500) in 1895 and to 7,850,000 guilders ($3,155,700) in 1897, divided into one hundred and fifty-seven shares of 50,000 guilders ($20,100), all placed and paid up. .

The fleet consisted January 1, 1899, of the following:

Name.	Gross tonnage.	Name.	Gross tonnage.
American	3,531	La Campine	2,595
Bremerhaven	3,255	La Flandre	2,047
Charlois	2,944	La Hesbaye	2,701
Chester	2,531	Ocean	2,326
Hainault	1,734	Rotterdam	4,157

The Royal Packet Company (Koninklijke Paketvaart Maatschappij) was organized September 4, 1888, and was incorporated for a term of fifty years from August 10, 1888; headquarters at Amsterdam. The capital is 6,000,000 guilders ($2,412,000), divided into two series, one amounting to 4,000,000 guilders ($1,608,000) and the other to 2,000,000 guilders ($804,000). Shares are 1,000 guilders ($402), and all have been placed.

There were issued in November, 1888, 4 per cent bonds to the amount of 2,000,000 guilders ($804,000), which was supplemented by a further issue of bonds of the same denomination (4 per cent) in 1889 to the amount of 1,000,000 guilders ($402,000), to be taken up by yearly drawings from 1892 to 1896, coupons due January 1 and July 1.

Of the profits, after paying 6 per cent to the shareholders, 10 per cent of the balance is carried to the reserve and the remainder is divided as follows: Fifteen per cent to the board of management, 5 per cent to the general agent, 5 per cent to the personnel, 20 per cent to the holders of certain notes, and 55 per cent to the shareholders.

The dividends have been—

	Per cent.
1890	0
1891	0
1892	2
1893	7
1894	9
1895	7.5
1896	10
1897	9

Dividends are payable in June.

The fleet consisted of the following steamers on January 1, 1899:

Name.	Gross tonnage.	Name.	Gross tonnage.
Bantam	2,132	Japara	1,249
Bawean	935	Lijn	1,014
Borneo	2,047	Maetsuycker	1,390
Boths	1,383	Maha Vajerunhis	1,182
Brouwer	559	Medan	665
Camphuys	712	Nieuhuys	663
Carpantier (de)	1,283	Outhoorn	1,717
Celebes	2,296	Pr. Alexander	1,099
Coen	1,386	Reael	1,383
Diemen (von)	1,284	Reynierz	661
General Pel	1,301	Reynst	1,438
Goens (von)	1,085	Riebeeck	664
Gouv. Gen. Jacob	2,176	Siak	397
Gouv. Gen. van Lansberge	895	Speelman	1,083
Gouv. Gen. Mijer	842	Swaerdecroon	661
Graaf van Bylandt	1,208	Swool (van)	1,825
Imhoof	1,900	Tambora	1,336

The balance sheet on December 31, 1897, was:

Debit.			Credit.		
	Guilders.			*Guilders.*	
Cash on hand	275,276	$110,661	Capital	6,000,000	$2,412,000
Money on deposit	929,000	373,458	4 per cent bonds	1,816,000	730,032
Service of loan of 1888	60,500	24,321	Bonds due January 1, 1898	190,000	76,380
Debt from formation of line	398,000	159,996	Coupons of bonds due January 1, 1898	40,120	16,128
Steamers of the company	6,040,000	2,428,080	Coupons of bonds not yet presented	6,703	2,695
Establishments in India	61,000	24,522	Insurance reserve account	703,661	282,872
Office furniture at Amsterdam and Batavia	2	....	Balance credit, officers and engineers	59,382	23,872
Steamers building	78,165	31,422	Reserve account	154,918	62,281
Insurance premiums paid in 1897	124,754	50,151	Supporting fund of personnel	78,555	31,574
Stock and warehouse	435,327	175,001	Sundry credits	294,328	118,320
Coal stock	229,847	92,398	Taxes	15,136	6,085
General agency at Batavia	985,720	396,259	Dividend account	540,000	217,080
Officers' and engineers' credit	59,074	23,748	Dividend specified notes	65,526	26,341
Supporting fund	63,819	25,655	Profit and loss account	1,915	769
Sundry debits	225,760	90,758			
Total	9,966,244	4,006,430	Total	9,966,244	4,006,430

The company does a coasting business in the Dutch East Indies.

The shares of the company are quoted on the Amsterdam exchange October 5, 1899, at 170.

The Zealand Steamship Company (Stoomvaart Maatschappij Zeeland) was organized June 22, 1875, and was incorporated for a period ending December 31, 1909; headquarters at Amsterdam. The ships of the company ply between Flushing (Vlissingen) and England.

The capital is 2,041,000 guilders ($820,482), divided into four thousand and eighty-two shares of 500 guilders ($201) each and two series, and all is placed.

Five per cent bonds were issued in 1875 to the amount of 1,000,000 guilders ($402,000) and 5 per cent bonds of 1885 to the amount of 2,000,000 guilders ($804,000), fully paid off. In October, 1886, a new 3 per cent loan was emitted to the amount of 3,600,000 guilders ($1,447,200), to be redeemed in forty years, of which loan on January 1, 1898, 3,054,000 guilders ($1,227,708) were in circulation. Coupons due in January and July. A loan was made July, 1895, to the amount of 2,810,898.35 guilders ($1,129,981) in connection with the State railways at 3½ per cent for the construction of three new steamers, the fleet of the company being mortgaged to the railway company.

After writing off depreciation, 5 per cent is paid to shareholders of the amount of their shares and also 5 per cent to the shareholders of Series A. The balance then remaining is divided as follows: Ten per cent to the reserve fund, 5 per cent to commissaries, 5 per cent to the management, 5 per cent to chief employees, and 75 per cent to the shareholders.

In 1897, the fleet, consisting of 10 steamers, made 730 voyages; 87,968 passengers were carried.

The gross receipts for the year 1897 were:

Description.	Amount.	
	Guilders.	
Receipts, passengers and baggage	707,164.58	$284,280
Carrying merchandise and parcels	507,750.30	204,116
Carrying mail	380,950.02	153,142
Rent of cabins	40,127.99	16,131
Extraordinary receipts	30,965.24	12,448
Total	1,666,958.13	670,117

Receipts per voyage were 2,283.50½ guilders ($918). Expenses of exploitation were 1,401,122.31½ guilders ($563,251); or, per voyage, 1,919.34½ guilders ($771). On June 1, 1897, a day service, in addition to the ordinary night service, was put on.

Dividends, from 1875 to 1881, nothing; 1882, shares Series A and B, 5.4 per cent; 1883, same, 6 per cent; 1884, 6 per cent; 1885, 6 per cent; 1886, 6 per cent; 1887 to 1897, nothing. Dividends payable first half of July.

The balance sheet on December 31, 1897, was:

Debit.			Credit.		
	Guilders.			*Guilders.*	
Cash on hand	181,527	$72,974	Capital	2,041,000	$816,462
Repairing shops	13.592	5,464	Bonds and stocks	2,545,000	1,023,090
Warehouse	20,179	8,112	Mortgage loan	2,810,898	1,129,981
Coal account	18,063	7,261	Reserve fund	22,506	9,047
Exchange account	39,423	15,848	Boiler fund	499,971	200,985
Money on deposit	93,000	37,386	Boiler fund, new steamers	56,058	22,535
Stock account	5,500	2,211	Guaranties	27,315	10,985
Printed matter	8,111	3,261	Bonds of 1886, drawn	4,000	1,608
Tickets	1,599	643	Interest account of same loan	46,080	18,524
Material for port service	6,082	2,445	Dividends not divided	300	121
Insurance account	63,835	25,661	Sundry credits	148,926	59,865
Deposit	27,315	10,981			
Reserve fund	22,250	8,945			
Boiler fund	432,764	174,051			
Boiler fund, new steamers	56,058	22,535			
Slaughterhouse, etc	1,309	526			
Steamers	6,585.543	2,647,388			
Wharves, buildings, and furniture	60,000	24,120			
Engines and tools	15,000	6,030			
Mortgage-loan fund	99,240	39,894			
Sundry debits	451,659	181,567			
Total	8,202,049	3,297,203	Total	8,202,049	3,297,203

The fleet consisted on January 1, 1899, of eight steamers:

	Gross tonnage.
Duitschland	1,653
Engeland	1,648
Nederland	1,660
Koningin Regentes	1,947
Koningin Wilhelmina	1,943
Prins Hendrik	1,945
Do	1,573
Willem Prins von Oranje	1,562

The preferred shares of the company were quoted on the Amsterdam exchange October 5, 1899, at 23¼; ordinary shares, 16.

The Netherlands Freight and Passenger Steamship Company (Maatschappij voar vracht- en passagiersvaart Nederlandsche Stoombootschappij) was organized October 12, 1896, for a period ending December 31, 1945, with headquarters at Rotterdam.

The capital is 600,000 guilders ($241,200), divided into six hundred shares, all placed.

On April 1, 1897, there were issued 4½ per cent bonds to the amount of 750,000 guilders ($301,500) in bonds of 1,000 guilders ($402); coupons due April 1 and October 1. The same is to be paid by drawings within thirty years, the first to take place in 1900, the last in 1927.

The profits are divided thus: Five per cent of the paid-up capital goes to shareholders; the remainder, up to 10 per cent, is carried to the reserve fund; after that, 5 per cent of balance goes to the management, 10 per cent to the commissaries, 5 per cent to same and managers as a premium, 10 per cent to initiators' shares, 70 per cent to the shareholders.

The steamers on January 1, 1899, were:

	Gross tonnage.
Batavier I	731
Batavier II	1,096
Batavier III	1,096
Holland	726

The Rotterdam Lloyd Steamship Company (Rotterdamsche Lloyd), the ships of which ply from Rotterdam to the Dutch East Indies, was organized July 6, 1883, for a period of twenty-five years; headquarters at Rotterdam.

The original capital was 4,000,000 guilders ($1,608,000) and was increased in 1893 to 6,000,000 guilders ($2,412,000), divided into twelve thousand shares of 500 guilders ($201) each, of which 5,000,000 guilders ($2,010,000) was placed. The entire capital must be placed by December 31, 1908.

On January 1, 1890, there was authorized a 4 per cent loan of 2,000,000 guilders ($804,000), of which 1,000,000 guilders ($402,000) was emitted, and in March, 1891, the remainder; coupons due January 1 and July 1. The remaining bonds, amounting on April 13, 1898, to 1,300,000 guilders ($522,600), were added, so as to make total emission 3,000,000 guilders ($1,206,000).

Dividends have been as follows from 1884 to 1897:

Year.	Rate.	Year.	Rate.
	Per cent.		*Per cent.*
1884	0	1891	6.5
1885	3	1892	5.5
1886	2	1893	6.2
1887	6.25	1894	6.5
1888	11	1895	6
1889	9.5	1896	3
1890	7	1897	8.5

The steamships of the company on January 1, 1899, were:

Name.	Gross tonnage.	Name.	Gross tonnage.
Ardjoeno	2,604	Oengarau (ex-Samarang)	2,585
Ariadne	1,254	Salah	2,612
Bogar	3,682	Senlar	1,293
Bromo	2,510	Smeroe (ex-Sœrabaya)	2,534
Drenthe	2,231	Soembing (ex-Batavia)	2,549
Gedé	2,995	Afrikaan	1,172
Lawoe (ex-Zuid-Holland)	2,602	Ameland (ex-Parhlands)	2,520
Malang	3,650	Indiaan (ex-County Derry)	1,887
Merapi	2,590		

The balance sheet December 31, 1897, was:

Debit.			Credit.		
	Guilders.			*Guilders.*	
Steamships	4,522,797	$1,818,164	Capital	4,000,000	$1,608,000
Building Wilhelmina quay	156,800	63,034	Bonds	1,400,000	562,800
Share account	36,113	14,517	Reserve fund	59,851	24,062
Stock account	399,822	160,728	Insurance account	370,818	149,068
Current year insurance	153,331	61,639	Reserve premiums	68,029	27,347
Cash on hand	328,638	132,113	Reserve losses	22,110	8,888
Sundry debits	284,523	114,378	Credits	88,924	35,747
Current voyages	69,921	28,108	Dividends and coupons not paid	1,773	713
Bills of exchange	25,270	10,159	Supporting fund	20,000	8,040
Deposit account	400,000	160,800	Dividend account	340,000	136,680
			Balance profit and loss	5,710	2,295
Total	6,377,215	2,563,640	Total	6,377,215	2,563,640

The shares of the company are quoted on the Amsterdam exchange October 5, 1899, at 136.

The Royal Netherlands Company for Petroleum in the Dutch East Indies (Koninklijke Nederlandsche Maatschappij tat exploitatie van Petroleum-bronnen in Nederlandsche-Indie) was organized June 16, 1890, for a period ending August 8, 1958; headquarters 'S Gravenhage (The Hague).

The original capital was 1,300,000 guilders ($522,600); increased in 1892 to 2,300,000 guilders ($924,600) and in 1896 to 5,000,000 guilders ($2,010,000), and again in 1898 by 1,500,000 guilders ($603,000). These last shares were all to be issued by January 1, 1899.

On July 1, 1896, there were authorized 4½ per cent bonds of 3,000,000 guilders ($1,206,000), of which 1,500,000 ($603,000) were payable in twenty-five years.

Under the statutes, only Netherlanders or residents of the Netherlands and the Netherlands Indies, or companies established in either, can be shareholders.

This company enjoys the privilege for seventy-five years from

August 8, 1883, granted by His Highness Panegren Indra di Radja, emir of Langkat, of developing petroleum wells along the Lipan River.

The company's fleet consisted on January 1, 1899, of the tank steamers *Babalan* of 536 tons, *Berandan* of 466 tons, *Besitang* of 417 tons, *Halaban* of 536 tons, and *Sultan von Lankat* of 3,225 tons—all built in 1896 and 1897.

The balance sheet on December 31, 1897, was:

Debit.			Credit.		
Indian administration.	*Guilders.*		*Indian administration.*	*Guilders.*	
Cash on hand	10,740	$4,317	Direction	8,430,497	$3,389,060
Bank account	356,337	143,247	Credits	212,588	85,460
Agents	353,819	142,235			
Debits	186,575	75,003			
Buildings and engines	842,586	338,720			
Refinery	960,638	386,176			
Dwellings	269,552	108,360			
Wells	60,293	24,238			
Pipes	550,258	221,204			
Decanville Railway	45,556	18,314			
Tank steamers	592,982	157,979			
Ships	229,431	92,231			
Warehouse stock	1,294,626	520,440			
Plant and bridges, etc	128,003	51,457			
Refinery at Besitan	1,593,826	640,718			
Tank installation at Pankalan Soesoe	101,969	40,992			
Refined petroleum	1,265,894	508,889			
Total	8,643,085	3,474,520	Total	8,643,085	3,474,520
Home administration.			*Home administration.*		
Concession	792,137	318,439	Capital	5,000,000	2,010,000
Reserve fund	792,700	318,665	Reserve account	806,214	324,098
Bonds deposited (not issued)	1,500,000	603,000	Extraordinary reserve account	9,054,500	3,639,909
Cash	121	49	4½ per cent bonds	3,000,000	1,206,000
Bank account	5,607,647	2,254,274	Creditors	41,343	16,620
Debtors	161,205	64,804	Dividend account	6,758	2,717
Tank installations	1,176,656	473,016	Profit and loss account	2,776,980	1,116,346
Stock and warehouse on same	441,396	17,847			
Merchandise shipped	1,309,507	526,422			
Office furniture	3,000	1,206			
Laboratory	2,000	804			
Tank steamers	247,629	99,547			
Administration of chief administrator	8,651,797	3,478,022			
Total	20,685,795	8,315,690	Total	20,685,795	8,315,690

The shares of the company are quoted on the Amsterdam exchange October 5, 1899, at 178–181.

POSTAL CONTRACTS.

By the law of April 8, 1893, the contract made under date of November 12, 1892, by the company with the Ministry of Water Ways, Trade, and Commerce and the Ministry for the Colonies was approved. This contract, covering the carrying of the mails between the Netherlands and the Netherlands East Indies, is as follows, as translated in this office:

ARTICLE 1. The company agrees to make regular fortnightly voyages with steamers under the Dutch flag from Amsterdam to Batavia, and vice versa, and to carry the mails in the way and manner hereinafter stipulated.

ART. 2. The company will be permitted to use, in carrying on this service as described in article 1, steamers now in use or those now building, the last named under the Ministry of Water Ways, Trade, and Commerce and the Ministry for the Colonies. When the company finds it impossible to carry on the service with the above-mentioned steamers, it will be empowered to charter temporarily such other steamers as shall be necessary for that purpose. It must, however, within the limit of twelve months, provide for the completion of its fleet. Steamers which may be brought into the trade in substitution for those mentioned in article 1, or for other reasons, must be constructed in Holland under plans and specifications approved by the ministries aforesaid. The obligation to build the steamers in Holland relates only, so far as their building in Dutch shipyards is concerned, to ships which come up to the requirements of the service of the company, according to the stipulations of this contract and the obligation to deliver them within the time they could be delivered if built in foreign shipyards and at no higher price. Any infraction of these conditions will be punished by a fine of 25,000 florins ($10,000) for each offense. All differences in explanation of or carrying out the terms of the foregoing shall be decided by three arbiters, who shall be named by both parties jointly. In case no understanding shall be reached by the parties to the contract as to their appointment within a period of six weeks, then the arbiters shall be named by the cantonal judge of the first canton at Amsterdam on the petition of the aggrieved party.

ART. 3. The steamers shall leave Amsterdam every fortnight on Saturdays and Batavia every fortnight on Wednesdays. The Ministries of Water Ways, Commerce, and Industry and of the Colonies are authorized to prescribe other sailing days on giving the company three months' notice. Notice of the precise hour of departure from Amsterdam or Batavia shall be given to the respective post-office by the commander or other officer in charge of the ship.

ART. 4. On the outward and return voyage, entry shall be made into the harbors of Genoa, Italy, and Padang, Sumatra, to take mails. The mail from the Netherlands to be forwarded by land, which will be taken on board at Genoa, must be ready to be transported from Genoa at 2 o'clock p. m. of the twelfth day out from Amsterdam. The postal authorities are, however, authorized to prescribe another hour of boarding the mails if the mail route should be changed. When delay from Amsterdam is foreseen, so that the steamer must reach Genoa after the twelfth day, as stipulated in article 3, the company must give notice immediately to the postal authorities of the Netherlands, specifying the day of the probable arrival of the steamer at Genoa. The mail must be ready to be boarded at 2 o'clock of the last-mentioned day at Genoa. In case the arrival of the mail from the Netherlands at Genoa should be delayed, the steamer must, if necessary, wait twenty-four hours, receiving therefor as compensation 200 guilders ($80) for every twelve hours' delay.

The ministries above named are authorized to have the mail shipped or delivered either temporarily or permanently at any other places than those named in this contract, and to make new regulations therefor, indemnifying the company duly for damage suffered. If the parties do not come to an agreement in the premises, the ultimate decision shall be referred to three arbiters, of approved character, to be appointed by the parties, who shall fix the amount of indemnity to be paid the company. The provisions of article 2 shall be applicable to the appointment of the arbiters.

ART. 5. The company is authorized on the outward and return voyages to enter steamers at the ports of Southampton, Port Said, Suez, Colombo, and such other ports as it might wish to enter afterwards; this, however, subject to the approval of the Ministries of Water Ways, Commerce, and Industry and for the Colonies. The steamers may also, notice being given to the postal authorities of the Netherlands, call at the port of Djeddah, the mail to be boarded or delivered at the said ports only when entry can not be made at the other ports mentioned.

ART. 6. On arrival at the port of destination or port of call on the voyage where the mail has to be delivered, the same shall be discharged in the first place and be transported to the post-office, according to the directions of the postal authorities of the Netherlands and the Dutch East Indies. In case of arrival at night, the transportation of the mail will take place as early as possible on the following morning. As to boarding the mail at Amsterdam or Batavia or other port, the company must comply with the regulations prescribed by the postal authorities of the Netherlands and the Dutch East Indies.

ART. 7. The voyage must be made, except in case of force majeure, as follows:

(1) From Amsterdam to Genoa and from Genoa to Amsterdam in twelve days.

(2) From Genoa to Batavia, leaving Genoa between April 1 and September 30, twenty-nine days; between October 1 and March 31, thirty days.

(3) From Batavia to Genoa, leaving Batavia between April 1 and September 30, thirty-one days; between October 1 and March 31, thirty days.

On the voyage to Batavia, the steamers are not allowed to remain longer than six hours at Genoa after boarding the mail.

ART. 8. If, in case of damage or on account of force majeure, the boats are compelled to enter a port on the voyage and remain many days, the company must forward the mails, if occasion offers, to their destination by the first opportunity afforded, expense of so forwarding to be for the account of the Government.

ART. 9. The mail must be placed on board the steamers apart from all other merchandise in a portion of the ship especially fitted up for the purpose, free from danger from water, fire, or other such destructive agency, or from theft. This place of deposit must be guarded by well-secured locks.

ART. 10. In case of accident or shipwreck, every possible means must be taken to save the mails. The company agrees to give special instructions to this end to the masters of the steamers.

ART. 11. The company receives payment for carrying the mails according to the scale stipulated for this service at the postal convention of July 4, 1891, or as may be stipulated later in case this convention should be changed. The Government guarantees to the company for mail service, in accordance with the above-referred-to scale, the sum of 2,400 guilders ($960) for every voyage from Amsterdam to Batavia and from Batavia to Amsterdam. In cases of voyages which for any reason are not made or are partially completed, the company shall receive no payment except the application to fines mentioned previously, according to article 18 *a*.

ART. 12. The company shall gradually increase the speed of the steamers either by improving same or replacing them by other steamers or in any other manner. Within five years from the going into force of this contract, the company shall shorten the voyage from Genoa to Batavia and from Batavia to Genoa by two days, and the voyage from Genoa to Amsterdam and from Amsterdam to Genoa by one day; as regards the voyage from Amsterdam to Genoa, not before the Ministries of Water Ways, Commerce, and Industries and of the Colonies shall request the same. The voyages must be made from Genoa to Batavia by sailings from

April 1 to September 30 in twenty-seven days; sailings from October 1 to March 31, in twenty-eight days; from Batavia to Genoa from April 1 to September 30 in twenty-nine days and from October 1 to March 31 in twenty-eight days; from Amsterdam to Genoa in eleven or twelve days, as before-mentioned ministers prescribe.

The guaranteed amount named in article 11 will be increased to 4,000 guilders ($1,600) per voyage from the time that the shortening of the voyages takes effect. If the company wishes to make a contract for still further shortening the voyages, parties will make agreements with respect thereto at a later date. If the company fails to fulfill the above-described requirement to shorten the voyage by two days (exclusive of clearly proved force majeure) at the end of the fifth year of the contract, the payment of the sum guaranteed by article 11 shall stop until the period when the voyages shall begin to be shortened.

ART. 13. The payment of the amounts due the company in accordance with this contract will be made quarterly by the Ministry of Water Ways, Commerce, and Industry on a statement to be made by the company.

ART. 14. The transportation of boxes, bags, or satchels which serve or may have served for carrying the mails and are returned empty by postal authorities at one place to those of another shall not be charged for.

ART. 15. Carrying of letters, outside the postal authorities' arrangements, by the company or by the crew of the steamers, is prohibited. In addition to the infliction of the penalties prescribed by law for such clandestine carrying of mail matter, the postal authorities of the Netherlands and the Dutch East Indies will be authorized to demand the discharge of persons from the service of the ships in case they are found guilty of repeatedly carrying such matter clandestinely.

ART. 16. The company is not permitted to transfer the service to third parties without the consent of the Ministries of Water Ways, Commerce, and Industries and of the Colonies. Agreements subletting such obligations require the approval of the above ministers before going into force.

ART. 17. The company is positively forbidden to make contracts with foreign postal authorities for transportation of mails by its steamers without the consent of the Ministries of Water Ways, Commerce, and Industry and of the Colonies, or to carry mail in any other way than by order of the postal authorities of the Netherlands and the Dutch East Indies. For every voyage, whenever such prohibited mail transportation occurs, the company loses all claim for mail payment; besides, the Government shall be justified in breaking the contract immediately without responsibility for indemnification for damage thus incurred.

ART. 18. Without prejudice in regard to claims which may be made against the company on account of nonfulfillment of agreements made by contract or by law, the following fines will be payable, except in case of force majeure.

(*a*) A fine of 700 guilders ($281) shall be inflicted for every day one of the steamers leaves Amsterdam or Batavia later than the day stipulated for sailing, with the understanding, however, that when the voyage has not been commenced within a week of the stipulated day of sailing a fine of 5,000 guilders ($2,010), without any deduction, will be imposed.

(*b*) A fine of 200 guilders ($80) will be imposed for every twelve hours or part thereof that the voyage from Amsterdam to Genoa of a steamer is delayed beyond the time prescribed in articles 7 and 12. For a delay of less than six hours, no fine may be inflicted.

(*c*) A fine of 20 guilders ($8.04) per hour will be imposed for the first six hours, of 25 guilders ($10.05) per hour for the second six hours, of 30 guilders ($12.06) for the third six hours, of 35 guilders ($14.07) for the fourth six hours that the voyage from Genoa to Batavia or from Batavia to Genoa lasts longer than the time stipulated in article 7, and, further, 35 guilders ($14.07) for every further delayed hour of arrival. As soon as the time of the voyage shall be reduced forty-eight hours, the above-mentioned fine will be increased as follows: Thirty-five guilders ($14.07) per hour for the first six hours, 40 guilders ($16.08) per hour for the second six hours, 50 guilders ($20.10) per hour for the third six hours, 60 guilders ($24.12) per hour for the fourth six hours, and 60 guilders ($24.12) further per hour for period in excess of one day.

(*d*) A fine of 1,500 guilders ($603) shall be imposed whenever a steamer, contrary to article 7, remains longer than six hours at Genoa.

(*e*) A fine of from 10 to 250 guilders ($4.02 to $100) shall be inflicted for taking insufficient care of the mail. * * *

(*f*) A fine of from 10 to 250 guilders ($4.02 to $100) shall be imposed for erroneous delivery of mail, etc. * * *

Article 19 provides that this contract shall endure for fifteen years.

Article 20 provides that the present contract shall be considered as a part of the contract made by the Government with the Rotterdam Lloyd Company and to be construed with reference to the same.

Article 21 provides that expense incurred in stamps, legalizations, etc., shall be for the account of the company.

The contract between the Government and the Royal West Indian Mail for carrying the mail from Amsterdam to Paramaribo and Curaçao and return, approved by the law of March 20, 1896, reads (substantially) as follows:

ARTICLE 1. The company agrees to carry the mail from Amsterdam to Paramaribo and Curaçao and from Paramaribo and Curaçao to Amsterdam by steamers under the Dutch flag once every three weeks.

ART. 2. The company is authorized to use for this service the steamers now in the service and those now building. In case of loss of any of the steamers, it is empowered to use steamers under foreign flags if no steamers under the Dutch flag are obtainable. The plans of the new steamers must be approved by the Ministry of Water Ways, Commerce, and Industry. If the company violates the preceding provisions, it shall be fined 15,000 guilders ($6,000).

ART. 3. The steamers shall sail from Amsterdam every three weeks, on Thursdays at 10 o'clock a. m. Steamers shall leave Paramaribo and Curaçao every three weeks, according to schedule. The day and time of sailing from Paramaribo and Curaçao must be given to the postal authorities forty-eight hours before by the agent of the company.

ART. 4. On the voyage from Amsterdam to Paramaribo, no other port may be entered without the consent of the Minister of Water Ways, Commerce, and Industry. In case mail is delayed at the port of departure, steamers must, if necessary, wait twenty-four hours, being indemnified therefor at the rate of 15 guilders ($6) per hour. On the voyage from Paramaribo to Amsterdam, the port of Havre may be entered and any other port agreed upon. If desired by the postal department, the mails and parcels post must be discharged at Havre or any other port.

ART. 5. The voyages, except in case of force majeure, must be made as follows: From Amsterdam to Paramaribo, nineteen days; from Paramaribo to Curaçao, ten days; Curaçao to Paramaribo to the time of departure from Havre, fifteen days; from Paramaribo to Havre, nineteen days; and from Havre to Amsterdam, four days.

ART. 6. On arrival at port of destination or any other port of call, mail must be delivered at once or brought to the post-office. In case of arrival at night, mail must be delivered as early as possible the next morning.

ART. 7. In case of being compelled to enter a port of call and a delay of three or more days be incurred, the company must forward the mail by first opportunity offering. The expense of such forwarding is for the account of the Government in case the delay be not caused by the carelessness of the company.

ART. 8. Mail matter and registered mail must be deposited on board the steamers in a safe, to be protected as much as possible against fire, water, and theft, the safes to be provided with good locks. Should there not be sufficient room in the safe, parcel-post matter may be stored in the hold.

ART. 9. In case of shipwreck, every possible means must be taken to save the mail, and masters of steamers must be instructed to take special precautions to that end.

ART. 10. The company shall receive for every voyage outward or inward the sum of 1,400 guilders ($560). If the parcel post consumes more than 2 cubic meters, 40 guilders ($16) per cubic meter shall be paid for the additional space. The company is authorized to transform the three weeks into a fortnightly service, the days of sailing to be arranged with the postal department. During the time that this contract remains in force, the company will receive payment at the rate of 47,600 guilders ($19,040) per calendar year for forty-eight or fifty-two voyages in the year. For voyages not made or partly made, no payment will be due.

ART. 11. Payments shall be made quarterly by the Minister of Water Ways, Commerce, and Industry.

ART. 12. Boxes, satchels, and bags that have been used in carrying the mails shall be returned free of charge.

ART. 13. Clandestine carrying of mails is forbidden.

ART. 14. The company can not transfer the service to third parties without consent of the Minister of Water Ways, Commerce, and Industry.

ART. 15. The company is inhibited from carrying mails for other governments without the consent of the ministry.

[Article 16 provides schedule of fines.]

ART. 17. The present contract is in substitution of the contract of February 14–19, 1883, extended under date of March 27–April 4, 1894, and March 25–26, 1895, and is for a period of five years, the Minister of Water Ways, Commerce, and Industry being empowered to terminate this contract at any time on the company's default. The company will be held to be in default in case of nonpunctual and irregular service.

[Article 18 provides that stamps, legalizations, etc., are for the account of the company.]

The contract with the Zealand Steamship Company for a mail service between the Netherlands and England was signed April 13, 1898, and approved by the law of July 14, 1898. The chief articles are:

ARTICLE 1. The company agrees to carry on a mail service, quick and regular, under the Dutch flag, twice a day, between Flushing and Queensborough, or such other English ports as may be agreed upon by the company and the Ministry of Water Ways, Commerce, and Industry.

ART. 2. The company shall use for the service described in article 1 first-class steamers of at least 800 tons, which are able to compete with the best steamers of like tonnage of other lines plying between England and the Continent. The steamers now in use are considered satisfactory for the service. When the vessels before mentioned prove hereafter to be inadequate, the company shall be authorized to charter such others as may be necessary. Her fleet must, however, as soon as possible, and at the latest within twelve months, be completed. Steamers which, according to article 2, must be substituted, or for other reasons may be brought into the trade, must be built in the Netherlands, according to plans to be approved by the Ministry of Water Ways, Commerce, and Industry. The obligation to build steamers in the Netherlands requires that they be built on Dutch wharves, and that they answer the needs of the company's service, according to the stipulations of the contract, and that they be delivered properly and duly and at a price no higher than would be required in foreign yards. For violations of the foregoing the company will incur a fine of 15,000 guilders ($6,000) for each infraction. Disagreements will be referred to three arbiters.

ART. 3. The director-general of the post-office and telegraph shall fix the hours of sailing of the steamers of the company in accordance with the requirements of the postal service.

ART. 4. Steamers shall wait one hour for mail trains when late.

ART. 5. The passage from Flushing to Queensborough and from Queensborough to Flushing must be made by the night steamer in six and three-fourths hours at the least and by the day steamer in eight hours at the least.

[Article 6 provides that other ports than the two specified may be selected. Article 7 provides that crew must be assisted in boarding the mail, etc.]

ART. 8. The company shall receive for carrying the mail: (*a*) For Dutch mail bags in both directions, 40,000 guilders ($16,000) per year; (*b*) for mail bags to and from foreign ports, a price to be fixed by the International Postal Union; (*c*) for parcel post to and from the Netherlands and other countries, 6 cents for every parcel not exceeding 5 kilograms (11 pounds) in weight. Government guarantees the company for service stated in *b* 260,000 guilders ($104,000), a monthly prepayment of 24,000 guilders ($9,600) to be made. The company receives monthly 24,000 guilders ($9,600) on account of the 300,000 guilders ($120,000) mentioned in sub *a* and *c*.

ART. 9. If the amount paid by foreign postal administrations, mentioned in sub *c*, article 8, exceeds the guaranteed sum of 260,000 guilders ($104,000), half of the balance is paid over to the Dutch postal administration.

ART. 10. Carrying of letters outside of mail bags by company or crew of their steamers is strictly forbidden. Besides enforcing regulations made by law on unlawful mail carrying, the postal administration can demand that persons in the service of the company, when repeatedly committing unlawful mail carrying, be dismissed.

ART. 11. On arrival of steamers at port of destination, the mail will be delivered first; if required, the crew of the steamer must assist therein. If for quicker delivery it is desirable to carry mail ashore by boat, the master must put such boat with crew at disposal of the postal officer aboard of steamer. In case such officer is not on board, the master must bring the mail ashore in the manner described.

ART. 12. The postal administration is entitled to have the mail accompanied by one or more officers. Besides a cabin, the postal officer will have disposal of a room connected with the cabin, with sufficient space for office. He will take his dinner at the passenger table. The company has to furnish the above free of charge.

ART. 13. The company can not transfer this service to third parties without approval of the Minister of Water Ways, Commerce, and Industry.

ART. 14. The company can not object to the supervision exercised by postal administration on British territory.

ART. 15. The company is positively prohibited to carry any other mail than is stipulated in this contract, and can not make any arrangements relating to same with British or other postal administrations.

ART. 16. The Minister of Water Ways, Commerce, and Industry is authorized to end this contract after October 1, 1902, if the amount collected for carrying foreign mail bags does not come up to half of the guaranteed sum of 260,000 guilders ($104,000) during a full calendar year, notifying the company thereof, however, one year in advance. The minister can also end this contract if the company does not comply with the conditions and stipulations. The company will be responsible for damages and interest to the Government and will have to pay the fines.

ART. 17. Except in case of force majeure, the company is subjected to the following fines:

(*a*) A fine of 10 to 250 guilders ($4 to $100) for insufficient care of the mail on board of steamers or by the crew in shipping and delivering same at Flushing and Queensborough.

(*b*) A fine of 10 guilders ($4) for every quarter steamers leave Dutch or English ports of departure later than is stipulated, except in case steamers have to wait for arrival of mail train.

(*c*) A fine of 10 guilders ($4) for every quarter or part thereof that the passage from Flushing to England or from England to Flushing takes longer than was stipulated by article 5.

(*d*) A fine of 50 guilders ($20) for every day's delay when another steamer is not put in place of a steamer taken out of service.

(*e*) A fine of 300 guilders ($120) every time that a steamer is not ready for the voyage and that in consequence thereof the voyage is not made.

(*f*) A fine of 100 guilders ($40) for every day's delay in carrying out instructions given by the postal administration or by the Government commissioner.

(*g*) A fine of $300 guilders ($120) if a steamer does not wait at least one hour for the arrival of delayed mail train.

ART. 18. The company is obliged to insure against mishaps every man employed by it.

ART. 19. The Minister of Water Ways, Commerce, and Industry will appoint a Government commissioner to see that the stipulations of this contract are carried out. The Government is authorized to make investigations on board of steamers and to be assisted therein by experts. The Government commissioner, or any other official ordered by the minister, is entitled to make the voyage on board of one of the steamers, without charge for his passage, to see that the stipulations of this contract are carried out.

ART. 20. This contract is made for the term of ten years, commencing October 1, 1898.

ART. 21. The expenses of stamps, etc., for this contract, etc., are at the charge of the company.

The contract made March 19, 1888, by the governor-general of the Dutch East Indies with the directors of the Netherlands Steam Navigation Company, transferred to the Royal Packet Company, for carrying on the packet service during a period of fifteen years (1891–1905) in the Dutch East Indian archipelago, reads as follows:

Managers of the company must be Dutchmen, if headquarters of the company is in the Netherlands; their representatives in Dutch East Indies must also be Dutchmen. The appointments of managers or of their representatives must be approved by the Minister of the Colonies if company has its headquarters in the Netherlands, and by the governor-general if the headquarters is in the Dutch East Indies.

The Government or the governor-general can appoint a Government commissioner, who will be present at the meetings of shareholders of the company, who will be admitted to the offices and archives of the company, and who may inspect their books and documents.

The company has to deposit with the Government a sum of 5,000 guilders ($2,000) as guaranty, at time of signing contract, for carrying on the stipulations of this contract, which sum will be refunded to the company if the contract is complied with and otherwise will be forfeited.

The Government will pay to the company per geographic mile of 15 to the degree made, the following amounts:

	Guilders.
(1) From Batavia, along the south coast, west coast, and northern coast of Sumatra, to Edi and back	1.50=$0.60
(2) From Padang to Olehleh and back	7.00= 2.80
(3) From Batavia, along Banda and Riouw, to Singapore and back	10.00= 4.00
(4) From Batavia along Banka, Palembang, Riouw, and Sumatra east coast to Edi and back	7.00= 2.80
(5) From Batavia along Sumatra, east coast to Edi and back	7.00= 2.80
(6) From Batavia along Billiton to Pontaniak and back	8.00= 3.20
(7) From Batavia along the north coast of Java to Sœrabaya and back	1.50= 0.60
(8) From Sœrabaya along Batavia to the southern or eastern division of Borneo and back	10.00= 4.00
(9) From Sœrabaya along Macassar, through the Moluccos, along Menado back to Macassar and Sœrabaya	5.00= 2.00
(10) From Macassar along Saleier and Boeton to the Kendari Bay and back	11.40= 4.56
(11) From Macassar to the islands in the Timor Sea and back	12.50= 5.00
(12) From Amboina along Banda, the island groups, and the islands in the Harafoera and Banda seas and back	15.00= 6.00
(13) From Amboina, along Ternate, to New Guinea and back	20.00= 8.00

The governor-general is authorized during the term of this contract to stop lines, to call for new lines, or to change lines. When lines are stopped, the company will be indemnified, the amount of indemnification to be fixed by this contract. The amounts to be paid for new lines or for the extension of existing lines are regulated by the governor-general.

The masters, mates, and engineers employed by the company must be Dutchmen, except in extraordinary cases, left to the judgment of the governor-general.

Except as otherwise provided, the Government exclusively makes use of the steamers of the company for carrying passengers, merchandise, and money on the lines contracted for.

The Government has at any time the right to hire one or more steamers from the company, paying per steamer, per day, and per register ton of 2.83 cubic meters, net contents: For the first 200 tons, 1.25 guilders (50 cents); for the second 200 tons, 1 guilder (40 cents); for the third 200 tons, 75 cents[*] (30 cents); and for the balance, 50 cents (20 cents).

The Government has the right at any time to make use or take possession of one or more steamers of the company, paying therefor the price, if necessary, to be fixed by experts. If, in consequence of war or general disaster, the exploitation expenses of the company are increased to such an extent that they exceed the ordinary rates 25 per cent during a year's period, the company will be indemnified, the amount of same to be fixed by the governor-general.

Carrying of Government passengers must be done at following prices, per geographic mile: First-class, 80 cents (32 cents), with a minimum of 10 guilders ($4);

---

[*] Dutch cents—that is, the one-hundredth of a guilder; United States cents in parentheses.

second-class, 40 cents (16 cents), with a minimum of 5 guilders ($2); third-class, 16 cents (6⅖ cents), with a minimum of 2 guilders (80 cents); fourth-class, 8 cents (3⅕ cents), with a minimum of 1 guilder (40 cents).

If there is room on the steamers, the company is obliged to carry private passengers and merchandise.

WAR VS. MERCHANT-MARINE SHIPBUILDING.

As I have not been able to obtain expert opinion upon the effect that the building of war ships has had upon the building of vessels for the merchant marine, a statement of the condition of the two foremost private shipbuilding yards in the Kingdom seems to be the best substitute therefor.

The Fijenoord Steamship and Engine Building Company was established November 10, 1823; headquarters at Rotterdam; duration unlimited. The capital was originally 2,000,000 guilders ($804,000), in shares of 500 guilders ($201) each; it has been reduced to 672,500 guilders ($269,000), divided into two thousand six hundred and ninety shares of 250 guilders ($100), all placed and paid up. Bonds were issued at 5 per cent May 22, 1880, of 1,000,000 guilders ($402,000), whereof there are outstanding 425,000 guilders ($70,000). Another 5 per cent loan of 500,000 guilders ($201,000) was emitted May 22, 1886, whereof there are outstanding 225,000 guilders ($90,000).

Dividends.

Year.	Rate.	Year.	Rate.
	Per ct.		*Per ct.*
1872–1883	7	1891	0
1884	0	1892	0
1885	4	1893	0
1886	3	1894	3
1887	0	1895	6
1888	0	1896	7
1889	0	1897	7
1890	0		

The balance sheet on December 31, 1897, was:

Debit.			Credit.		
	Guilders.			*Guilders.*	
Stock account	147,489	$59,290	Shareholders	672,500	$270,345
Cash	190,889	76,737	Loan of May 22, 1880	425,000	170,850
Yards, buildings, engines, etc	1,036,660	416,737	Loan of May 22, 1886	225,000	90,450
Tools, etc	277,651	111,619	Unpaid drawn bonds	150,000	60,300
Work on hand	107,315	43,141	Unpaid interest and dividend coupons	25,503	10,252
Work contracted for	2,380,507	956,962	Money received on unfinished contracts	2,222,941	893,623
Debits	107,922	43,385	Credits	245,249	98,590
			Renewal and reserve fund	230,000	92,460
			Profit and loss account	52,245	21,002
Total	4,248,438	1,707,872	Total	4,248,438	1,707,872

The Royal Steamship and Engine Building Company de Schelde was established October 8, 1875; seat, Flushing; duration, thirty-five years; commenced November 1, 1875.

The capital is 600,000 guilders ($240,000), divided in three series, each of two hundred shares of 1,000 guilders ($402), all placed and paid up. Bonds were issued at 4½ per cent April 30, 1894, of 1,000,000 guilders ($402,000), to be refunded within forty years, at a minimum amount of 25,000 guilders ($10,000) per year.

Dividends.

Year.	Rate.	Year.	Rate.
	Per ct.		*Per ct.*
1879	5	1893	5
1880	5	1894	5
1881	5.5	1895	7.4
1882	6	1896	7
1883–1891	None.	1897	7
1892	5		

The balance sheet on December 31, 1897, was:

Debit.			Credit.		
	Guilders.			*Guilders.*	
Buildings, sheds, etc	1,802,729	$724,697	Capital	600,000	$241,200
Dry dock Prins Hendrik	1	....	Bonds	925,000	371,850
Wharf at Middleburg	300	121			
Tugboat Jacob	1	....	Writing off for depreciation	616,544	247,851
Dwellings	1	....	Sundry credits	449,068	180,525
Furniture account	1	....			
Land bought	1	....			
Machinery and tools	13,907	5,590	Prepayments on works in course of construction	2,088,508	839,581
Bonds in cash	185,000	74,371	Reserve fund	4,541	1,825
Cash account	3,019	1,214	Balance profit	220,875	88,792
Sundry debits	122,492	49,242			
Wares account	86,249	34,672			
Works in construction	2,685,299	1,079,490			
Reserve fund	4,541	1,825			
Extension factory	995	400			
Total	4,904,536	1,971,624	Total	4,904,536	1,971,624

All the data used in this report and the text of the postal contracts have been translated from the Dutch in this office.

FRANK D. HILL,
Consul.

AMSTERDAM, *October 6, 1899.*

UNITED KINGDOM.

LONDON.

CONDITION OF MERCHANT MARINE.

The merchant marine of Great Britain is the most extensive and important in the world, and its condition is excellent. The British vessels that entered and cleared with cargoes and in ballast at ports in the United Kingdom during 1898 numbered 652,083, with a tonnage of 169,949,278 tons. The number of foreign vessels that entered and cleared for the same period amounted to 61,054, with a tonnage of 30,898,778 tons. The following table shows the total number and tonnage of British vessels that entered and cleared at ports in the United Kingdom during 1896, 1897, and 1898:

Entered and cleared.	1896.		1897.		1898.	
	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.
Entered	368,892	84,824,074	364,646	86,806,760	327,377	85,132,533
Cleared	333,987	78,604,038	330,208	80,299,586	324,706	84,816,745
Total	702,879	163,428,112	694,854	167,106,446	652,083	169,949,278

It will be observed that the number of vessels has decreased each year, whereas the tonnage has increased. The decrease, it may be mentioned, is in the number of sailing vessels. The above totals include vessels which cleared for foreign ports and also coastwise. The tonnage of British sailing and steam vessels that entered and cleared with cargoes and in ballast at ports in the United Kingdom engaged in foreign trade only amounted in 1898 to 64,216,728 tons, while the tonnage of foreign vessels amounted to 26,747,238 tons.

GOVERNMENT POLICY.

The Government of this country does not pursue any particular policy for the purpose of promoting its merchant marine. Subventions are paid for the use of certain vessels as armed cruisers in case of war, and payments are made for the carriage of mails.

The payment by the revenue department for packet services is estimated, for 1899, to amount to £836,350 ($4,070,097), and for 1900 to £784,055 ($3,815,603). The amount paid for the use of certain ships as armed cruisers in case of war aggregates nearly £50,000 ($243,325) per annum.

WAR VESSELS.

War ships are continually being built both for British and for foreign navies. The number of war ships built in the United Kingdom for foreigners in 1898 was 17, with a gross tonnage of 13,312 and a net tonnage of 6,732. The effect which the building of war ships has upon the construction of merchant vessels may be said to consist chiefly in increasing the rate of wages paid to workmen and enhancing the price of materials, which would be available for building merchant ships if no war ships were constructed.

SUPERVISION OF MERCHANT MARINE.

The merchant marine is under the control of the Board of Trade; but such control consists principally in protecting life and property and in the payment, discharge, and shipping of seamen.

Recommendations are frequently made to the Government by chambers of commerce on questions affecting the interests of shipowners. These chambers of commerce are situated in every important town in Great Britain and often act in concert. I append copy of proposed legislation on merchant shipping made in 1884, with replies from chambers of commerce and steamship owners. I also inclose copy of the merchant shipping acts, 1894 to 1897.*

The policies of other nations toward their merchant shipping do not meet with much discussion or criticism in this country, nor are they copied.

MATERIALS FOR SHIPBUILDING.

With regard to the materials used for shipbuilding, practically the whole of the steel plates and bars and the forgings are produced in this country; but some large steel castings are at present being imported from Herr F. Krupp, of Essen, Germany, mainly in consequence of English makers being very busy and their prices accordingly very high.

With reference to timber, the largest quantity used is pitch pine from our Southern States. Considerable quantities of Canadian yellow-pine deck timber and East India and Burma teak wood are used; also, deals from the Swedish and Russian ports in the Baltic for ceiling and other rough work.

Some of the wood-working machinery now in use in shipyards in this country was made in the United States.

The present price of steel plates delivered in the shipyards is £7 10s. ($36.50), and the present price of angle and bulb bars is £7 2s. 6d. ($34.67). It should be noticed that in depressed times steel plates have been delivered as low as £4 15s. ($23.11) and steel bars as low as £4 10s. ($21.90).

---

* These documents have been transmitted to the Commissioner of Navigation.

WAGES.

With regard to the average weekly wages in shipyards, a great part of the iron work is done as piecework. Ship riveters and iron molders are so paid. The following are the rates of wages:

Trade.	Hours per week.	Rate per week.			
		s.	s.	d.	
Pattern makers	53		40	0	$9.73
Ship carpenters on wood work	54		40	6	9.85
Ship carpenters on iron work and liners off	54		43	6	10.58
Ship joiners	54		39	6	9.61
Joiners' machinists	54		39	6	9.61
Painters	54		34	0	8.27
Painters' laborers (on plain work, as on hulls and interiors of holds	54		29	0	7.06
Riggers	54		30	0	7.30
Plumbers	54		36	0	8.76
Shipyard laborers	54	*18 to	23	6	$4.38 to 5.82
Gas-furnace men	54		27	0	6.57
Coal-furnace men	54		25	0	6.08

*Average about 22s. 6d. ($5.47).

The above trades work habitually "on time." Ship riveters never work "on time." They earn "on piece" from 60s. to 70s. ($14.60 to $17.03) per man a week. Iron molders, working "on time" 53 hours, make 35s. ($8.62) per week. Brass molders, under the same conditions, earn 38s. 6d. ($9.37) per week. The iron molders nearly always work "on piece" and earn about 60s. ($14.60) per week per man. Sheet-iron workers earn 36s. to 38s. ($8.76 to $9.25) per week.

The rates named are, except when otherwise stated, the minimum current rates. Some of the men on better jobs may get a shilling or two per week more than the amount stated, but the number is small.

In this connection, I append report and statistical tables* relating to the changes in rates of wages.

With reference to the wages paid in the foreign trade on steam and sail vessels to able seamen, boatswains, quartermasters, etc., and on steam vessels to firemen, coal passers, engineers, etc., I append tables showing progress of British merchant shipping,* issued June 13, 1899.

WM. M. OSBORNE,
Consul-General.

LONDON, *September 12, 1899.*

---

*Transmitted to the Commissioner of Navigation.

LIVERPOOL.

CONDITION OF MERCHANT MARINE.

The condition and extent of the British merchant marine is shown in the annual navigation returns published by the Board of Trade (Government publication), and also in Lloyd's Register. According to the Government's latest publication, entitled Tables Showing the Progress of British Merchant Shipping, which appeared in June, 1899, the mercantile marine of the British Empire, including all vessels flying the British flag, amounted to 10,460,643 net tonnage for the year 1898. From the same source it is gathered that the number of vessels is decreasing, but the tonnage increasing. It is difficult to say what amount of British trade is carried by British vessels, as a great deal of the country's tonnage is employed between foreign countries, say the United States, South America, the continent of Europe, and the British colonies. In the year 1898, the imports into the United Kingdom amounted to $2,286,039,912 and the exports to $1,428,907,981, and it is estimated that about two-thirds of the total quantity was carried in British bottoms. When the demand for shipping is at all active, British vessels are invariably fully employed. The following figures show the tonnage of all vessels cleared in the United Kingdom and the other principal maritime countries during the years 1890 and 1897, giving the tonnage of the national ships and their proportion to the total tonnage:

Country.	Tonnage.		Percentage of national ships to total tonnage.	
	1890.	1897.	1890.	1897.
United Kingdom	53,973,112	64,426,545	72.7	71.4
Russia	958,258	1,559,053	7.9	8.6
Norway	3,468,381	4,084,586	64.8	66.6
Sweden	3,624,301	5,299,623	33.7	35.6
Denmark	4,693,308	5,925,036	58.4	56.1
Germany	9,275,710	10,918,269	43.9	42.4
Holland	3,122,125	4,214,340	28.8	24.9
Belgium	2,203,012	2,897,472	19	18.2
France	9,254,879	9,551,538	31.9	30.3
Spain	10,473,542	12,901,199	43.8	44.8
Italy	3,473,148	4,101,661	24.4	24.1
United States	8,149,878	11,143,470	22.5	23.5
Argentine Republic	3,214,465	5,551,537	27.1	43.1
Japan	701,405	1,402,501	22.2	19.1

The figures of the above comparison do not seem to indicate any great fluctuations in the proportion of foreign trade which each nation is carrying for itself, excepting in the case of the Argentine

Republic, where a notable increase took place. During the year 1898, it appears that 709,870 tons were added to the British mercantile marine, as compared with 489,835 tons in 1897.

GOVERNMENT SUBSIDIES.

The Government does nothing to promote the merchant marine in the way of subsidizing it or the builders who construct it. Payments, aggregating some $243,000 per annum, are made to four companies for the call of certain steamers as armed cruisers in case of war, of which the two great trans-Atlantic companies receive about $72,900; the Pacific and Oriental Steamship Company, $55,890; and the Canadian Pacific Company, $36,450 towards the fast service between Vancouver and Australia. The number of steamers subsidized is eleven, but the Admiralty has a further right to call upon fourteen other steamers for transport service. The mail subsidies for the current year amount to $3,815,100, towards which the colonies and India contribute $850,500. (This is exclusive of South Africa.) These services are put up to competition, and the cheapest bidder, having regard to efficiency, secures the contract.

Lately, an attempt has been made to encourage shipowners to increase the number of apprentices they carry, by making concessions to them in light dues, the object being to increase the supply of efficient officers for the navy.

WAR VESSELS.

So far as the port of Liverpool is concerned, the building of war ships is confined to one firm. I have been unable to obtain from them information as to the extent of war ships built or as to the effect of this building upon the cost of constructing merchant ships. At Barrow-in-Furness, in this consular district, the building of war vessels has recently assumed great proportions. At the present time, there are under construction at one company's works two first-class battle ships, three first-class cruisers, and two 30-knot torpedo-boat destroyers, representing a total displacement of 66,750 tons, and an indicated horsepower of 112,500. Men who have been accustomed to the first-class workmanship necessary on war vessels find it difficult to adapt themselves to the cheaper class of work on merchant ships; consequently, when war-ship building is undertaken on a large scale, it is difficult to compete for the building of merchant shipping.

OFFICIAL SUPERVISION.

The Government department supervising the merchant marine is the Board of Trade, but its officials direct their energies solely to such matters as concern the due protection of life and property;

they make no recommendations for its betterment in any other way.*

There are many acts of Parliament relating to the merchant marine, but in 1898 they were consolidated. They refer to tribunal matters and can not be said to aim at stimulating or retarding its growth.

While much interest is taken in shipping circles in Liverpool regarding the policies of other nations toward their own merchant shipping, there is no perceptible sign that the British policy has been influenced, beyond stimulating British shipowners to greater efficiency and economy in the working of their fleets.

Chambers of commerce in the United Kingdom consist generally of manufacturers and merchants or exporters, their objects being to obtain cheap transport. They agitate against "shipping rings" and any combinations calculated to keep freights beyond a normal rate. At the request of shipowners, the chamber in Liverpool constantly takes up and presses upon the Government questions affecting the interests of shipowners. The chamber of shipping in London is supposed to discuss all questions from the shipowners' point of view. In Liverpool, there is a shipowners' association, where questions of interest to shipping are discussed and the policy of the Government freely criticised, as shown by the following extract from one of their annual reports:

> Whilst so much has been done for the fighting navy, the mercantile marine has not been forgotten. Legislation on all manner of subjects has been proposed, and Government after Government has almost invariably been ready to promote such legislation, whatever grievance has been alleged, and whatever remedy has been suggested. Year after year, the management of the mercantile marine has been taken more out of the hands of the shipowners and placed in the hands of the officials of the Board of Trade, until at the present time there is no industry in the country that is so watched and worried by official control. It is useless to hope for the return of the days of George III, when a bill was justified by a preamble that set forth that "it is of the utmost consequence and importance to promote the increase of the number of ships and vessels belonging to the United Kingdom;" but is it too much to expect that before any further restrictions are placed on the free action of those responsible for our mercantile marine Parliament will consider what has been attained by interfering with that freedom in the past? The shipowners do not want freedom from responsibility, nor do they suggest that all Government inspection is unnecessary; but they do insist that they should be allowed to carry on and develop their trade free from all unnecessary restrictions.

---

* Under orders of the Board of Trade, vessels are detained as unsafe by reason of the defective condition of their hulls, equipments, or machinery, or by reason of overloading or improper loading. The number of vessels found to be unsafe during the period July 1, 1898, to June 30, 1899, on account of defective equipment of hulls, etc., was 15. Of this number 8 were wooden sailing ships, 3 were iron or steel steamships, 3 were wooden steamships, and 1 was an iron or steel steamship. In addition, 1 wooden sailing ship was reported by the crew to be defective. In the cases of overloading or improper loading, 27 iron or steel steamships were reported to be unsafe; also 2 wooden sailing ships and 1 iron or steel sailing ship. Twenty-three of these vessels were of foreign nationality.

If all the restrictions and regulations that have been imposed by the Legislature were really for the benefit of the country, or even if their outcome were valued by the country at large, the shipowners would have no right of complaint; but the British shipowner has been forced to comply with condition after condition, and to submit to Government control at every turn, to attain objects for which the country cares nothing. The foreign vessels which come to our ports are free from almost all of these conditions, and yet so little do the traveling public value the British regulations that they are ready to sail in these foreign ships and to pay for their passages the same fares as are charged on the British vessels. Our merchants pay the same freights and the same insurance on their goods, whether brought in British or foreign vessels, and our agitators, who are pressing for new regulations, are constantly drawing unfavorable comparisons (which, however, are entirely misleading) between the safety of life in our own and in foreign mercantile navies.

All British steamships carrying emigrants (and almost all the Atlantic liners do carry emigrants) have to comply with rules which define the number to be carried, their accommodation and food, the number of the crew by which the vessel is to be manned, the boat accommodation to be provided, and a host of other conditions. These conditions are enforced against a foreign vessel taking emigrants from this country; but they are not enforced against a foreign vessel with emigrants on board embarked elsewhere which takes only cabin passengers from this country, although it is obvious that the safety of the cabin passengers depends on the safety of the emigrants. For instance, an American vessel sailing from Southampton and taking both emigrants and cabin passengers is subject to the same regulations as a British vessel, but a German vessel taking emigrants from Hamburg and calling at Southampton for the purpose of taking cabin passengers has not to comply with any of these requirements. The German vessel must comply with the regulations in force in Hamburg; but how widely those differ from the British regulations can be appreciated when it is stated that if one typical British mail passenger steamship were sailed under the German flag she could carry 1,203 emigrants, against the maximum of 924 she now carries, and that, although her carrying capacity would thus be increased by 30 per cent, she would carry nearly 40 per cent less boat accommodation than she is compelled to carry under the British law.

These figures are an example showing how seriously the British shipowner is handicapped in dealing with his foreign competitors. The country has thought it right to impose these restrictions on the British shipowner, but practical tests abundantly demonstrate that it puts no value on the safety thereby attained.

Cargo vessels are as much, if not more, handicapped by the Government regulations. An owner who sells his vessel because he is unable to sail her at a profit under the British flag sees her bought—not to be broken up, but to be sailed in and out of his own port under a foreign flag, manned with fewer hands, and, loaded more deeply than the laws of this country would permit, but nevertheless earning the same freight and carrying goods that are insured at the same rates as he received and paid. Whatever, therefore, may be the merits of the regulations, it is clear that the business minds of the country do not value them to the extent of a single sixpence.

All this interference is, beyond question, telling on the British mercantile marine as a whole. There are many signs that the shipowners and the investors in shipping companies are becoming seriously discouraged. Many of them have lost the greater part of their capital by the substitution of steam for sailing vessels and of steel for iron, and of late years, foreign competition on unequal terms has rendered it impossible to make any profit.

The committee that had for upwards of two years been collecting evidence on the manning question has made its reports, and the Government should have no difficulty in coming to a conclusion that on the manning question nothing but mischief can result from adopting the hard and fast scales recommended by the majority of that committee. If the evidence had proved that the safety of life required the adoption of an official manning scale, then such scale would be justified; but the evidence proved nothing of the kind, and nothing short of safety of life can justify the Government in forcing a manning scale on the shipowners of this country. No such scale is in force in any other country, and it must be borne in mind that every law which presses unduly on the shipowner tells equally against the wages of the seamen.

MATERIALS FOR SHIPBUILDING.

Steel plates, sections, etc., used in shipbuilding are almost all produced in this country. The timber is almost wholly imported from the United States, Canada, and the East Indies.

The current prices of steel plates for the hulls of vessels run from $37.71 to $41.97 per ton for plates one-fourth of an inch thick and up.

SHIPBUILDERS' WAGES.

The weekly wages paid in the shipbuilding yards at Liverpool are as follows:

Patternmakers	$9.60
Machinists	7.29
Riveters	8.75
Ship carpenters	9.48
Joiners	9.11
Painters	8.26
Furnace men (strikers)	5.59
Riggers	8.75
Plumbers	8.75
Platers	$9.73 to 10.21
Laborers	4.86

Wages at Barrow-in-Furness (in this consular district) per week of fifty-four hours are:

Ship carpenters	$9.42
Joiners	9.30
Painters	8.75
Furnace men	6.32
Riggers	8.02
Plumbers	9.30
Sheet-iron workers	9.36
Iron molders	$9.24 to 10.21
Brass molders	8.99 to 9.48
Laborers	4.38 to 5.83
Riveters (on piecework)	14.59 to 18.24

SEAMEN'S WAGES.

The average monthly wages at the port of Liverpool paid in the foreign trade on British steam vessels (cargo and passenger) are as follows:

Mates	$55.61
Second mates	40.83
Third mates	33.52
Boatswains	25.48
Carpenters	31.50
Quartermasters	19.46
First engineers	87.11
Second engineers	62.10
Third engineers	45.14
Firemen	20.31
Trimmers (coal passers)	17.73
Able seamen	18.03

The average wages paid on British sailing vessels are:

Mates	$34.10
Second mates	22.13
Third mates	16.21
Boatswains	19.58
Carpenters	24.22
Sailmakers	17.99
Able seamen	13.80
Ordinary seamen	9.52

The vessels of various nationalities at this port do not, as a rule, ship their crews here, but at home ports; and only in cases of desertion or illness are men engaged here as substitutes. The wages paid to these are governed by the prevailing ratès paid on British vessels. In the case of Swedish and Norwegian, French, and German vessels, the rates paid here are lower, as shown by the following table:

Class.	Swedish and Norwegian.	French.	German.	Spanish.
Sailing vessels.				
Boatswains	$19.46	$17.37	$18.24	....
Carpenters	$19.46 to 21.89	15.44	19.46	....
First mates	21.89 to 24.33	$28.95 to 34.74	$24.33 to 38.93	....
Second mates	14.59 to 17.02		19.46 to 29.19	....
Seamen	14.59 to 17.02	11.58	12.16	....
Ordinary seamen	12.16 to 14.59	....	....	....
Cooks	....	15.44	....	....
Quartermasters	....	....	15.80	....
Steamers.				
Boatswains	19.46 to 26.76	19.30	....	$19.46
Carpenters	21.89 to 26.76	15.44	....	19.46
First mates	19.46 to 34.06	48.25		
Second mates	14.59 to 24.33		....	....
Seamen	14.59 to 17.14	11.58	....	16.52
Ordinary seamen	12.38 to 14.59	....	....	....

Class.	Swedish and Norwegian.	French.	German.	Spanish.
Steamers—Continued.				
Firemen	$14.59 to $15.80		$12.16 to $14.59	$17.51
Coal passers	13.38 to 14.59	$13.51	9.73 to 14.59	
First engineers	58.39 to 97.33	77.20	48.66 to 72.99	77.86
Second engineers	38.93 to 58.39	48.25	36.48 to 48.66	58.39
Third engineers	29.19 to 43.79	33.77	29.19 to 36.48	48.66
Fourth engineers				9.73
Lieutenants		28.95		
Donkey men		19.30		19.46
Greasers		19.30		18.48
Stokers (firemen)		17.37		13.62
Oilers			9.73 to 12.16	
Cabin boys				12.65
First officers				43.79
Second officers				34.06

W. J. SULIS,
Vice and Deputy Consul.

LIVERPOOL, *August 30, 1899.*

SOUTHAMPTON.

The accompanying statistics show the importance of the merchant marine to Great Britain:

Total tonnage of vessels, British and foreign, entered and cleared with cargoes and in ballast at ports in the United Kingdom from and to all countries.

Entered and cleared.	British.	Foreign.	Total.
1897.	*Tons.*	*Tons.*	*Tons.*
Entered	32,191,459	12,731,870	44,923,329
Cleared	32,235,086	13,040,448	45,275.534
Total	64,426,545	25,772,318	90,198,863
1898.			
Entered	31,856,934	13,268,410	45,125,344
Cleared	32,359,794	13,478,828	45,838,622
Total	64,216,728	26,747,238	90,963,966

Tonnage of British and foreign vessels entered and cleared with cargoes only at ports in the United Kingdom from and to all countries.

Entered and cleared.	British.	Foreign.	Total.
1897.	*Tons.*	*Tons.*	*Tons.*
Entered	25,339,655	9,296,496	34,636,151
Cleared	28,101,298	11,206,978	39,378,206
Total	53,440,953	20,503,474	73,944,427
1898.			
Entered	25,171,847	9,343,957	34,515,804
Cleared	27,959,322	11,503,320	39,462,642
Total	53,131,169	20,847,277	73,978,446

Total tonnage of British and foreign steam vessels entered and cleared with cargoes and in ballast at ports in the United Kingdom from and to all countries.

Entered and cleared.	British.	Foreign.	Total.
	Tons.	*Tons.*	*Tons.*
1897.			
Entered	30,685,610	9,744,131	40,429,741
Cleared	30,686,423	9,936,865	40,623,288
Total	61,372,033	19,680,996	81,053,029
1898.			
Entered	30,442,620	10,335,984	40,778,604
Cleared	30,953,278	10,584,908	41,538,186
Total	61,395,898	20,920,892	82,316,790

Tonnage of British and foreign steam vessels entered and cleared with cargoes only at ports in the United Kingdom from and to all countries.

Entered and cleared.	British.	Foreign.	Total.
	Tons.	*Tons.*	*Tons.*
1897.			
Entered	23,994,895	6,692,326	30,687,221
Cleared	26,751,982	9,083,549	35,835,531
Total	50,746,877	15,775,875	66,522,752
1898.			
Entered	23,971,607	6,824,299	30,795,906
Cleared	26,776,927	9,635,582	36,412,509
Total	50,748,534	16,459,881	67,208,415

Tonnage of vessels of the different countries entered and cleared with cargoes and in ballast at ports in the United Kingdom from and to all countries.

Nationality.	1897.		1898.	
	Entered.	Cleared.	Entered.	Cleared.
	Tons.	*Tons.*	*Tons.*	*Tons.*
British	32,191,459	32,235,086	31,856,934	32,359,794
Norwegian	3,154,054	3,207,888	3,304,469	3,300,494
German	1,992,026	2,054,195	2,237,020	2,302,892
Swedish	1,245,494	1,285,848	1,361,666	1,366,492
Danish	1,272,552	1,306,978	1,407,119	1,421,794
Dutch	1,256,440	1,266,069	1,292,940	1,321,186
French	1,068,838	1,043,810	1,025,102	1,002,628
Belgian	675,851	676,599	701,876	703,070
Spanish	738,264	733,333	692,994	684,672
Russian	339,093	349,585	382,386	408,014
Italian	238,181	263,345	298,760	345,106
United States	348,679	362,271	153,441	161,000
Austrian	126,172	147,770	117,749	130,048
Greek	161,685	171,464	101,714	114,332
Portuguese	52,850	57,386	43,194	40,846
Other countries	61,091	113,907	147,980	176,254
Total	44,923,329	45,275,534	45,125,344	45,838,622

Tonnage of steam vessels only of each nation entered and cleared with cargoes and in ballast at ports in the United Kingdom from and to all countries.

Nationality.	1897.		1898.	
	Entered.	Cleared.	Entered.	Cleared.
	Tons.	*Tons.*	*Tons.*	*Tons.*
British	30,685,610	30,686,423	30,442,620	30.953.278
German	1,710,352	1,730,551	1,973,854	2.019.930
Norwegian	1,604,630	1,624,859	1,815,532	1,832,456
Dutch	1,176,194	1,186,403	1,221,672	1,249,966
Danish	1,073,682	1,100,960	1,210,960	1,225,763
Swedish	916,376	940,220	1,028,477	1,043,843
French	871,899	853,806	828,279	827,653
Belgian	675,542	676,330	701,354	702,541
Spanish	728,525	724,042	681,304	674,522
Italian	147,784	160,699	194,306	246,289
Russian	121,466	135,112	151,053	170,738
United States	325,269	333,865	137,542	147,710
Austrian	123,257	142,804	114,754	125,176
Greek	160,220	170,325	96,320	112,755
Portuguese	49,043	47,594	37,848	35,394
Other countries	59,892	109,295	142,729	170,142
Total	40,429,741	40,623,288	40,778,604	41,538,186

Tonnage of British and foreign steam vessels only, entered and cleared coastwise, with cargoes only, at ports in the United Kingdom.

Entered and cleared.	British.	Foreign.	Total.
1897.	*Tons.*	*Tons.*	*Tons.*
Entered	26,031,058	84,861	26,115,919
Cleared	26,105,680	89,166	26,194,846
Total	52,136,738	174,027	52,310,765
1898.			
Entered	26,370,358	96,918	26,467,276
Cleared	26,202,974	93,001	26,295,975
Total	52,573,332	189,919	52,763,251

Total number and tonnage of vessels in the United Kingdom registered under the merchant shipping acts, including Jersey, Guernsey, and the Isle of Man.

Description.	1897.			1898.		
	Number.	Tons nets.	Tons gross.	Number.	Tons net.	Tons gross.
Sailing	11,911	2,589,570	2,758,358	11,566	2,387,943	2,550,819
Steam	8,590	6,363,601	10,401,202	8,838	6,613,917	10,829,811
Total	20,501	8,953,171	13,159,560	20,404	9,001,860	13,380,630

Number and tonnage of sailing and steam vessels built in the United Kingdom for the British merchant service.

Description.	1897.		1898.	
	Number.	Tons.	Number.	Tons.
Sailing	518	66,729	665	41,839
Steam	536	415,538	705	654,158
Total	1,054	482,267	1,370	695,997

Tonnage of British and foreign vessels entered and cleared with cargoes and in ballast at some of the principal ports to and from all countries.

Port.	1897.		1898.	
	Entered.	Cleared.	Entered.	Cleared.
	Tons.	*Tons.*	*Tons.*	*Tons.*
London	9,110,925	6,686,734	9,437,764	7,158,438
Liverpool	5,845,384	5,415,667	6,170,454	5,998,348
Cardiff	4,485,782	7,504,927	3,188,599	5,599,506
Hull	2,278,875	1,862,107	2,466,714	2,160,766
Newcastle	2,060,302	3,150,122	2,247,334	3,363,533
Southampton	1,573,956	1,434,253	1,548,684	1,374,927
Glasgow	1,418,724	2,002,662	1,457,705	2,226,738
Leith	966,249	864,996	1,023,819	953,298

Tonnage of British and foreign vessels entered and cleared coastwise, with cargoes only, at ports in the United Kingdom.

Entered and cleared.	British.	Foreign.	Total.
1897.	*Tons.*	*Tons.*	*Tons.*
Entered	31,932,645	138,725	32,071,370
Cleared	30,824,872	136,671	30,961,543
Total	62,757,517	275,396	63,032,913
1898.			
Entered	30,772,204	142,070	30,914,274
Cleared	30,369,540	134,551	30,504,091
Total	61,141,744	276,621	61,418,365

Sailing and steam vessels built for foreigners for war and mercantile purposes.

Description.	1897.		1898.	
	Number.	Tons.	Number.	Tons.
Sailing	73	22,971	31	3,051
Steam	156	139,459	165	171,560
Total	229	162,430	196	174,611

Vessels, tonnage, and persons employed in home and foreign trade on all vessels (exclusive of inland navigation).

Description.	Number.	Tons.	Persons employed.
1897.			
Sailing	8,585	2,473,017	63,915
Steam	6,838	6,452,796	177,016
Total	15,423	8,925,813	240,931
1898.			
Sailing	8,108	2,312,696	59,167
Steam	7,099	6,768,032	183,386
Total	15,207	9,080,728	242,553

Shipbuilding at this port is purely local, being confined at present to yachts and very small vessels. The tonnage of vessels built here in 1898 amounted to only 6,132 tons, as against 2,636 tons in 1897.

SEAMEN'S WAGES.

There are three lines of steamers whose crews are practically all secured at this port—the American Line,* to New York; the Royal Mail, to South America and the West Indies; and the Union Line, to the Cape. The following are the wages paid per month:

Class.	American Line.*	Royal Mail.	Union Line.
First officer	$120	$73.00 to $82.75	$68.25 to $87.50
Second officer	70	43.75 to 48.75	48.75 to 58.50
Third officer	70	31.75 to 39.00	31.75 to 39.00
First engineer	150	121.75	97.25 to 121.75
Second engineer	100	77.75 to 87.50	63.25 to 77.75
Third engineer	85	58.50 to 73.00	48.75 to 58.50
Engineers	$40 to 65	48.75 to 58.50	48.75
Firemen	40	23.00	23.00
Coal passers	30	18.25 to 23.00	18.25 to 23.00
Able-bodied seamen	25	19.50	19.50

JOHN E. HOPLEY,
Consul.

SOUTHAMPTON, *October 5, 1899.*

DUBLIN.

The extent of the commercial marine of the United Kingdom of Great Britain and Ireland and of the British Empire, as per latest report available—that for the year 1897—is as follows:

United Kingdom:	Tons.
Steam	6,363,601
Sailing	2,589,570
Total	8,953,171

---

* Officers, engineers, deck department, and many firemen, coal passers, and seamen are shipped at New York.

British Empire:	Tons.
Steam	6,836,965
Sailing	3,579,477
Total	10,416,442

Lloyd's Register for 1898–99 gives the total tonnage of the United Kingdom and colonies, including both steam and sailing, as 13,665,312 tons.

The condition is said to be excellent.

As the merchant marine of the British Empire is more extensive than that of any other country, its importance is manifest and its maintenance is absolutely necessary for the prosperity of the country.

It has been the boast of Great Britain that, however its supremacy in other industries might be threatened by rival nations, the world's commerce is, for the most part, carried on in British ships. It also claims, at the present time, to be without a serious rival. But the more intelligent are beginning to foresee that competition is likely to arise by reason of the increased activity in shipbuilding in the United States, Germany, and Russia.

GOVERNMENT SUBVENTIONS.

The policy of this Government seems to be to promote its merchant marine by payments for the transportation of mails and subventions for the use of ships for auxiliary naval purposes.

The following figures are from the annual reports of the postmaster-general. The amount paid for foreign and colonial packet service is as follows:

Year ended March 31—	Amount.	
1895	£778,927	$3,790,648
1896	762,341	3,709,933
1897	770,943	3,751,794
1898	779,412	3,793,008
Estimates made by revenue department:		
1899	836,350	4,070,097
1900	784,055	3,815,604

In the estimates for 1899, the amount appropriated for African service was increased £48,000 ($233,592) over the estimate for 1898 for service between the United Kingdom and Cape Colony. In the estimates for 1900, this amount was omitted. In the same year (1899) the contract for conveyance of mails from Liverpool to Callao was increased £6,500 ($31,632) and the following year (1900) reduced by £8,500 ($41,365). Making allowance for these two items, the amount appropriated for the year ended March 31, 1899, would be £781,850 ($3,804,883), and for the year ending March 31, 1900, £786,055 ($3,825,337). There was an increase of £3,000 ($14,600) for 1900 for service between the United Kingdom and the United States, viz, £130,000 ($632,645) for 1900, against £127,000 ($618,045) for 1899.

The estimated loss on the over-sea service is as follows:

Year.	Amount.	
1895	£444,960	$2,165,398
1896	431,570	2,100,236
1897	439,900	2,140,773
1898	507,843	2,471,418

The postmaster-general's report for 1899 is not yet published.

Subventions are paid to various companies for the privilege of taking some of their ships for war purposes.

The following is a list of merchant steamers held at the disposal of Her Majesty's Admiralty, for use as armed cruisers in case of need, at the beginning of the present year, 1899:

Ship.	Owners.	Gross tonnage.	Indicated horse-power.	Speed.
				Knots.
Campania *	Cunard	12,950	30,000	22
Lucania *	do	12,952	30,000	22
Etruria	do	8,120	14,500	20
Umbria	do	8,128	14,500	19½
Aurania	do	7,269	9,500	16
Servia	do	7,392	10,000	16½
Victoria *	Peninsular and Oriental	6,527	7,000	17
Himalaya *	do	6,898	10,000	18
Australia *	do	6,901	10,000	18
Arcadia *	do	6,188	7,000	17
Oceana	do	6,188	6,000	17
Britannia	do	6,525	7,000	17
Rome	do	5,545	5,500	16
Peninsular	do	5,287	5,000	15½
Oriental	do	5,284	5,000	15½
Valetta	do	4,904	5,000	15½
Massilia	do	4,902	5,000	15½
Carthage	do	4,879	5,000	15
Ballaarat	do	4,778	4,500	14½
Parramatta	do	4,756	4,500	14½
Majestic *	White Star	9,965	16,000	20¼
Teutonic *	do	9,984	16,000	20¼
Germanic	do	5,066	5 200	17
Britannic	do	5,004	5,200	16
Adriatic	do	3,888	3,600	14
Empress of India *	Canadian Pacific Railway	5,905	10,000	18
Empress of China *	do	5,905	10,000	18
Empress of Japan *	do	5,905	10,000	18

* Receives annual subvention.

The amount paid for subventions is not made public, but the Peninsular and Oriental Steam Navigation Company received £11,625 ($56,573) each year for the years 1896, 1897, and 1898.

In response to an order of the House of Commons, the Admiralty furnished a report* giving full particulars as to the merchant steamers chartered and employed by the Admiralty as naval cruisers, transports, etc., during the Egyptian campaigns 1883–1886.

I am unable to find that any change of importance in the policy pursued by this Government has been made of late.

WAR VESSELS.

There are no war ships built in Dublin.

The following, from Sell's Commercial Intelligence, London, April 8, 1899, shows the tonnage of war ships built by the Government for nine years, the total cost, and the cost per ton:

> It is generally known that the rise in the prices of materials and the increased complexity of ships of war have caused the cost of naval shipbuilding to rise greatly during late years. The following figures show the course of this movement:

Output of Government dockyards.

Year.	Vessels.	Displacement.	Total cost.		Cost per ton.	
		Tons.			£ s.	
1890	8	22,520	£1,230,910	$5,990,224	49 0	$238.46
1891	8	68,100	3,847,590	18,724,296	56 10	274.95
1892	9	50,450	2,920,430	14,212,273	58 0	282.26
1893	9	32,400	1,729,450	8,416,368	53 0	257.92
1894	8	26,700	1,803,510	8,776,782	67 10	328.49
1895	8	70,350	4,399,690	21,411,091	60 10	294.42
1896	9	73,970	4,287,000	20,863,685	59 12	290.04
1897	4	31,885	1,752,700	8,529,515	55 0	267.66
1898	9	73,090	4,575,120	22,264,821	67 14	329.46

> These figures show that between the years 1890 and 1898, there was an increased cost of nearly £19 per ton for the completed ship of war, which is, of course, a serious factor in the annual naval expenditure.

SHIPBUILDING RETURNS.

The following, from the same paper, shows total tonnage of every description under construction for quarter ended July 30, 1899:

> Lloyd's Register shipbuilding returns for the quarter ended June 30 shows that, excluding war ships, there were 568 vessels of 1,386,367 tons gross under construction in the United Kingdom at the close of the quarter, as compared with 580

---

* Copy of report, sent by the consul, has been transmitted to the Commissioner of Navigation.

vessels of 1,322,068 tons gross at the corresponding period of 1898. Of the steam vessels under construction, 541 were of 10,000 tons gross or more. The total number of British war ships under construction was: At royal dockyards, 18 vessels of 166,970 tons displacement; at private yards, 40 vessels of 183,230 tons displacement. The total number of foreign war ships under construction at private yards in this country was 27 vessels of 101,875 tons displacement.

If the construction of war ships everywhere should cease, it would naturally—following the law of supply and demand—cheapen the cost of building merchant ships by causing those mechanics now at work on war ships to seek employment at the yards building merchant vessels, thus making a larger supply of labor; and, unless the building of merchant vessels were largely increased, would cause a reduction in wages. Also, a lessened demand for such material as is used in the construction of both classes of vessels would naturally reduce the price. These together would in time, all things being equal, cause a considerable reduction in the cost of constructing merchant vessels.

The following shows that it requires about one-half of the new construction to replace the loss by shipwrecks, abandonment, etc.:

THE ANNUAL LOSS OF SHIPPING.*

Not many people appear to be aware of the large extent to which the replacement of tonnage is required for the mercantile marines of the world in consequence of losses at sea by wrecks, collisions, and otherwise. Lloyd's Register has this week issued a statement which makes this loss very clear, and from which it would appear that the loss from different causes for a single quarter is at the rate of over 1,000,000 tons a year for the twelve principal maritime countries, being about one-half of the total tonnage constructed throughout the world in the year 1898, when the new tonnage was greater than in any previous year. Nearly one-half of the whole loss is accounted for by wrecks, and the rest is due to vessels being abandoned, condemned, burnt, foundered, collided, and missing.

The following figures show how the vessels removed from the registers of different countries for the quarter ended December 30, 1898, were disposed of:

Description.	Number.	Gross tonnage.
Abandoned at sea	53	37,948
Broken up, condemned, etc	53	31,712
Burned	8	7,565
Collision	24	19,361
Foundered	27	15,658
Lost, etc	7	4,177
Missing	38	20,399
Wrecked	204	126,118
Total	414	262,938

---

* From Sell's Commercial Intelligence, April 29, 1899.

The following figures show the gross tonnage on the registers of the different countries and the percentage of the vessels and tonnage owned by each country that was lost during the quarter:

Flag.	Steam and sailing vessels owned according to Lloyd's Register book, 1898-99.		Percentage lost (steam and sailing vessels together).	
	Number.	Tons.	Vessels owned.	Tonnage owned.
British:			*Per cent.*	*Per cent.*
United Kingdom	9,044	12,587,904	0.78	0.69
Colonies	2,099	1,077,408	1.1	0.97
United States of America	3,150	2,448,677	3.21	2.18
Austro-Hungarian	284	349,814	1.06	1.35
Danish	760	422,856	0.92	1.43
Dutch	383	444,450	2.61	2.05
French	1,151	1,179,515	1.22	0.55
German	1,604	2,113,981	1	0.31
Italian	1,162	855,478	1.29	1.42
Norwegian	2,663	1,643,217	2.67	1.94
Russian	1,159	594,434	1.64	1.19
Spanish	712	621,143	0.42	0.56
Swedish	1,373	552,785	2.91	2.69

From the above table, it appears that the percentage of loss to the total tonnage owned was less in the case of the United Kingdom than in that of most of the other countries tabulated, but was more than that of Germany, France, or Spain.

SUPERVISION OF MERCHANT MARINE.

Her Majesty's Privy Council consists of over two hundred members, and the Board of Trade is a committee of the Privy Council for trade, and not a board of trade as understood in the United States.

This committee, besides supervising the merchant marine, takes cognizance of railroads, fisheries, harbors, bankruptcy, weights and measures, labor, general statistics, etc., and publishes regularly the Board of Trade Journal.

As far as my observation goes, the policies of other nations are not criticised here, nor copied. On the contrary, other nations are copying the policy of this country. Some of the British colonies, notably Victoria and Queensland, have adopted the policy of paying bounties upon the export of agricultural products, such as green fruits, frozen or chilled meat, and wool. They propose also to offer a bonus on the export of honey, tobacco, flax, and hemp, which would tend to increase their exports, creating freights for the British merchant marine.

Every city of any size throughout the Kingdom has a chamber of commerce, board of trade, or some such organization. These, in turn, have an association of chambers of commerce, which holds stated meetings, either in London or with some chamber in the province, to which the several chambers of commerce send representatives. At meetings of both local and associate chambers, discussions on business matters are held, resolutions adopted, and committees appointed to bring to the notice of the Board of Trade or Parliament any alleged wrongs or injuries to any of the various interests.

SHIPPING RINGS: DIFFERENTIAL FREIGHTS.

The following extract from a meeting of the Associated Chambers of Commerce in London, held March 25, 1899 (at which Ambassador Choate was present), explains itself:

> On the motion of Sir A. Hickman, M. P. (Wolverhampton), seconded by Mr. Goodman (Birmingham), a resolution was passed declaring that the maintenance of shipping rings, by the action of which goods were charged higher freights from British than from foreign ports, was most injurious to our trade, and urging the Government to discontinue the payment of any subsidies to shipping lines which gave preferential rates to goods from foreign ports. Other resolutions were passed expressing the opinion that the 6d. stamp for bills of lading was a severe tax upon home traders, and requesting the executive to endeavor to have it reduced to a 1d. adhesive stamp, which should suffice for bills of lading for goods shipped by inland navigation or coastwise.

That the existence of shipping rings is a great injury to British merchants, there seems to be no question.

In addition to complaints made and resolutions adopted at meetings, letters are written and published in the newspapers, and editorial articles are printed in the influential journals, to bring to the notice of the general public as well as of the authorities the evils of which complaint is made.

The following is from an editorial in Sell's Commercial Intelligence of February 4, 1899:

> Shipping rings are quite as crying an evil as monopolist railways. They have done a great deal to shut out British manufactures from the Indian, Chinese, Japanese, South African, and other markets. The evil would not seem to be so formidable did it not happen that the very shipping firms that are not subsidized by our own Government carry goods to the East and elsewhere more cheaply from continental ports than from our own. This impeachment is not denied; but it is argued, in justification, that if the traffic was not taken at low rates it could not be got at all, because of the excessively low rates quoted by continental shipping firms. This may very well be, but it does not make the evil nor the grievance any the less. The matter, of course, is one that Parliament can not deal with, except in relation to the payment of what are usually called subsidies for carrying the mails. But private traders can deal with it by raising the needful capital to estab-

lish rival lines. In this respect, railway and shipping conditions are on a very different basis. The private trader can not build opposition railways, because they would be ultra vires of the powers conferred by Parliament on existing lines. But there is no reason why other steamship lines should not be established, except the probability that they could not be made to pay unless a large percentage of merchants and others agree to ship only by the new lines. With such a provision, the present system of differential freights could be broken down without much difficulty, and the sooner an attempt is made in this direction the better, if the trade in the East still left to us is to be much longer retained.

The following, from the same paper of June 8, 1899, covers a great deal of ground:

For the last ten or twelve years, there has been almost as much of a strain in the relations of shipping companies and traders as there has been in the relations of traders and railway companies. The reason is not far to seek. The shipping companies, as a rule, are naturally desirous to get as large a slice as they can of the cost of carrying freight to and from the United Kingdom, not only as against the competition of other steamship companies at home, but also as against similar companies abroad and in the leading foreign ports. The railway companies endeavor, by every means within their power, to get monopolies of particular trades and districts, and when they fail to accomplish this result, they agree between themselves to carry traffic under conditions which practically get rid of competition as to rates, although not necessarily as to routes or facilities. In shipping transportation the same conditions apply. It is many years since it was discovered in this country that "where combination is possible, competition is impossible." Hence the organization of freight rings, which aimed at securing the monopoly of particular trades and markets. The principal markets that were affected by this movement were those of South Africa, India, Australia, China, and Japan. The so-called "conferences" thus established sought to make contracts with shippers which bound them to ship all their goods to particular markets by certain lines, offering as a consideration for doing so a certain amount of rebate on the usual tariff, usually ranging from 7 to 12 per cent of the nominal charge. At the same time, the shipping rings crushed out the competition of private and outside freight vessels by withdrawing rebates from the shippers who supported them, and generally making it uncomfortable for those who dealt with any shipowners outside the ring. The ring was, in one case, brought to book as to its methods and operations—in that of the Mogul Shipping Company, in which China merchants were warned that if they shipped by particular vessels they would lose the rebate otherwise allowed. Not only so, but the combination cut rates to such an extent as to make the competition of the Mogul Company all but impossible, and this ultimately led to legal proceedings being taken against the ring for an unlawful conspiracy to deprive particular parties of their share of the trade. In the result the courts ruled that the combination was not illegal, was not in restraint of trade, and was not amenable to corruption or bribery, so long as false rumors, intimidation, or fraud were not made use of to destroy the competition of others. Up to the present time, this decision has been accepted as final, and hence the shipping companies continue to be at liberty to make whatever arrangements they please to keep up monopolistic rates so far as they can. It is true that there has all along been a certain amount of competition, but it does not amount to a great deal in the case of Indian and Australasian freights.

The average freighter, moreover, is usually tied to the ring by considerable rebates, which are canceled if the freighter ships by other vessels, and by threats that the ring vessels will not carry at all except under conditions which are often embarrassing and difficult to comply with.

Another drawback with which traders have long had to contend, and which seriously injures the industry of Great Britain in relation to foreign markets, is the lower rates of freight at which traffic is carried from continental than from British ports. For a number of years, freights from Germany and Belgium were about 10 per cent on the cost of the iron and steel exported, whereas from London and Liverpool the average freights were about 15½ per cent of the cost of the iron and steel exported. In other words, some of the most powerful companies made a practice of carrying from Antwerp to Bombay or Calcutta for 10s. ($2.43) per ton, while the freight from London or Liverpool was 15s. 9d. ($3.83). It might be supposed that continental steamships were able to carry, and did carry, at lower rates of freight than British steamships because they were more largely subsidized. Such, however, is not the case. Within the last few months the total amount paid as subsidies by the German Government amounted to £343,750 ($1,672,859) a year, while the similar postal subsidies paid to British steamship companies amounted to nearly as much again, or £653,276 ($3,179,168) a year. Naturally, the fact that British freight charges have been from 40 to 60 per cent higher than those charged on the Continent has greatly helped Germany and Belgium in all the markets of the East. It has enabled those countries to secure a very large slice of our colonial and Indian markets that would otherwise have been difficult, and perhaps impossible. With the same rates of freight as those paid from continental ports, British traders would have had a much larger share of the trade of India, Australasia, and South Africa than they have had or possess at the present time. To maintain their monopolies, the shipping rings have been resorting to some anomalies that have naturally evoked a large amount of indignation and resentment as well as loss. Many cases of this sort might be cited. A typical case is that of the American shipper of cotton goods, who, according to evidence recently submitted by the Blackburn Chamber of Commerce, could ship to Shanghai via Liverpool for 25s. 6d. ($6.20) per ton, while the English merchant who ships from the same port has been called upon to pay 40s. ($9.73). Another similar case is that of wine exports, which, according to Mr. Chamberlain's blue book on the trade of the British Empire, are exported from German ports to Victoria as low as 9s. ($2.19) per ton, against 16s. ($3.89) charged by steamship companies from Liverpool. Still another case is a freight rate of 57s. 6d. ($13.99) from New York to London, against a freight of only 30s. ($7.30) from New York to Shanghai. These cases might, however, be multiplied indefinitely. In a paper read last year before the British Association, Mr. J. R. Galloway estimated that shippers of cotton goods to Calcutta paid relatively 7s. 8d. ($1.87) per ton more than the rate ruling to Bombay, and that this was equal to an overcharge of more than £47,000 ($228,726) a year on the actual amount of trade carried; while the Hamburg rate to Singapore was 22s. 6d. ($5.47), or less than half the rate charged for similar freight when carried from Hamburg, whether in German or British bottoms.

Complaints of differential freights discriminating against British exporters are made.

The following is from the same paper of April 15, 1899:

A remarkable letter from Mr. F. Brittain appears in the Sheffield Telegraph, showing how Germany fosters her industries and commerce. After giving an account of her "scientific system of protection" and judicious encouragement of her mercantile marine, he calls attention to another important item which greatly tells against British exporters—the question of freights—and appends a list which is of itself sufficient to account for the loss of British trade, without any of the concomitant failings on the part of our merchants, of which our consuls so frequently complain. Here is Mr. Brittain's list of freights:

List of freights.	Freight charges.	
Hardware.	*s. d.* *s. d.*	
New York to Sydney........per ton...	15 0	$3.65
London to Sydney........do......	40 0	9.73
New York to New Zealand........do......	10 0	2.43
London to New Zealand, by same shipowner........do......	32 6	7.91
Iron.		
Amsterdam to Java, via Liverpool, including transshipment...do......	20 0	4.87
Liverpool to Java direct, same shipowner........do......	30 0	7.30
New York to Australia........do......	5 0 to 10 0	$1.22 to 2.43
Liverpool to Australia........do......	15 0 to 25 0	3.65 to 6.08
Cotton goods.		
United States to Shanghai, via Liverpool........do......	26 6	6.45
Liverpool to Shanghai, same shipowner........do......	47 6	11.46
Birkenhead to China........per 40 cubic feet...	40 0	9.73
New York to China........do......	22 6	5.47
Antwerp to China........do......	19 6	4.74

Another complaint arises by reason of the selling of British-made ships to other countries, causing serious competition for British exporters. The paper above quoted, March 25, 1899, says:

Seeing how greatly Great Britain is dependent on ships and shipping for her prosperity, the warning that Mr. Consul-General Hertslet gives in his report from Havre, which we publish in another column, is a timely one. He says:

"The tendency of British sailing-ship owners to sell their vessels to Norwegian, German, and other foreign buyers seems to be on the increase. The ships transferred are not merely old and well-used ones, which are generally sold to Norwegians, who are able, owing to the less restricted laws of Norway, to make use of them under conditions which are impossible to British owners. If such only were the case, there would be nothing to call for special comment; but among the vessels sold during the year was a modern sailing ship of 2,932 tons, built and equipped with the latest improvements, a ship which, with its great carrying capacity and comparatively small cost for maintenance, might have been expected to be a source of profit to its owner. The fact seems to be that Scandinavians and Germans, to whom British sailing ships are mostly sold, are able to run them on more economical principles, both in regard to the rates of pay and the maintenance on board of the officers and crew, than is possible under the British flag."

MATERIALS FOR SHIPBUILDING.

The principal metallic materials used in shipbuilding are produced in this country. The timber, or lumber, is mostly imported.

WAGES.

The weekly wages paid in shipyards are:

Workmen.	Wages.	
	Shillings.	
Pattern makers	36	$8.76
Machinists	36	8.76
Riveters	36	8.76
Ship carpenters	36	8.76
Joiners	36	8.76
Painters	36	8.76
Furnace men	45	10.94
Riggers	36	8.76
Plumbers	36	8.76
Sheet-iron workers	40	9.73
Iron molders	40	9.73
Brass molders	36	8.76
Laborers	18 to 21	$4.38 to 5.11

The average monthly wages paid in this port in foreign trade on steam and sailing vessels are:

Class.	Wages.	
Seamen	£5	$24.33
Boatswains	6	29.20
Carpenters	7	34.07
Quartermasters	7	34.07
First mates	10	48.67
Second mates	8	38.93
Firemen on steam vessels, coal passers, and oilers	6	29.20
First engineers	12	58.40
Second engineers	10	48.67
Third engineers	6	29.20

COSTS OF TRANSPORT.

The following, showing the cost per ton per mile of running a modern cargo steamer, with coal at 20s. ($4.87) per ton (from Sell's Commercial Intelligence of July 22, 1899), is of interest:

It is a well-known fact in connection with steam navigation that a modern cargo steamer, with coal at 20s. ($4.87) per ton, is able to carry 100 tons of paying load 1 mile for 0.377d. (0.76 cent) for coal alone, or 0⅞d. (1.77 cents) if the cost of working the ship and insurance be included. Railway transport is considerably dearer in fuel and in everything else. To haul 100 tons of paying load for 1 mile on an ordinary railway line, at ordinary coal prices, costs 0.57d. (1.15 cents) for that item alone, while the whole working cost, taking it at 50 per cent of gross receipts, would be 11d. (22 cents) per mile for haulage. Traction engines cost about 3d. (6 cents) and horse haulage about 9d. (18 cents) per ton per mile under normal conditions. But until 1854, marine engines had never been made which consumed less than 4½ pounds of coal per indicated horsepower per hour, which is practically three times as much as the fuel consumption of modern practice.

The cost of coal is a very important element, not only in the running of steamships, but in building the same. Complaints are bitter from both owners of ships and builders of the advance in price not only of coal, but of building material.

The following statements show that the ocean transportation business has been, and still appears to be, very profitable.

The Peninsular and Oriental Steam Navigation Company's report shows net earnings for the year ending September 30—

Year.	Net earnings.		Vessels.	Tonnage.
1896	£473,959	$2,306,521	85	293,986
1897	493,497	2,401,600	85	286,734
1898	451,157	2,195,555	89	307,743

Capital, including £800,000 ($3,893,200) 3½ per cent debentures, £3,120,000 ($16,059,450).

Much of the larger part of the earnings was applied to repairs, renewals, reduction of book values, general maintenance, and interest, showing conservative management.

The dividends paid were equivalent to 7½ per cent in 1896, 9 per cent in 1897, and 7½ per cent in 1898, on a capital of £2,320,000 ($12,166,250).

An analysis of the annual report of the Cunard Steamship Company, Limited, shows net earnings for the years—

Year.	Net earnings.		Vessels.	Tonnage.
1896	£245,254	$1,193,285	30	116,993
1897	214,459	1,043,665	31	119,215
1898	249,406	1,213,734	27	114,332

Much the larger part of the net earnings is devoted to depreciation of ships and insurance reserve fund; dividends at the rate of only 2½ per cent being paid in 1896 and 1897, and 3½ per cent in 1898, on a paid-up capital of £1,600,000 ($7,786,400).

This company has no debenture or other stock, all being common.

The following, showing the extremely conservative management of this company, is from the balance sheet for year ended December 31, 1898: Total cost of the existing fleet, including spare gear outfits, machinery, etc., and wharf properties, £3,840,326 ($18,688,949); charged to depreciation, £2,133,410 ($10,382,239); present book value, £1,706,916 ($8,306,710). In addition to this low valuation, the company has insurance and reserve fund and profit and loss accounts of £404,005 ($1,966,090).

DIRECT COMMUNICATION WITH IRELAND.

The great advantage of direct communication by steamers is manifest, particularly in the case of Ireland. A line of steamers sailing direct from Baltimore to this port and Belfast enables merchants in the United States, in those places contiguous to, or on a line of railroad communicating with, Baltimore to sell and deliver merchandise here that could not be sold if the same had to be shipped via Liverpool, Glasgow, or any other port in England or Scotland. The cost of transshipping, high freights across the Irish Sea, and losses caused by additional handling would practically prohibit the trade.

I am pleased to state that this direct trade is largely increasing,

JOSHUA WILBOUR,
Consul.

DUBLIN, *August 29, 1899.*

GLASGOW.

The port of Glasgow ranks high in point of importance as a shipping center of the United Kingdom. Although inferior to Liverpool and London as regards actual imports and exports, the amount of shipping owned in Glasgow is exceeded only by that owned in London and Liverpool, and, when the large amount of shipbuilding contracted on the Clyde is taken into consideration, its position in the shipping world assumes large proportions. In addition to a great number of steamers trading to and fro, Glasgow has regular lines to and from all parts of the world, many having their headquarters in Glasgow, chief among which may be mentioned the Allan, Anchor, Donaldson, Clan, City, Gulf, and Mutual lines and the firms trading to Spanish ports. At present, the mercantile marine of Glasgow is in an exceedingly prosperous condition, freights being well sustained and the value of shipping proportionately increased.

WAR SHIPS AND EFFECTS OF BUILDING UPON MERCHANT VESSELS.

The construction of war vessels on the Clyde has a material influence on the price of shipbuilding material of every kind, and consequently owners of merchant vessels have to cope with enhanced prices for steel plates and labor. When the Government announces that it is sending out tenders for war vessels, the steel market rises at once, and manufacturers send out enhanced quotations for their various brands. There has never been a time in the history of Clyde shipbuilding when so many war vessels have been under construction as during the last twelve months. Owners of merchantmen who could delay ordering new vessels for a time waited to see if they could get better terms, but the market is still rising, in consequence of the increasing scarcity of material and delay in delivery. The Admiralty, in fact, must have vessels built by a specified time, at whatever cost to the builders themselves, and consequently the owners of all other kinds of craft are forced to pay more money for their new vessels. During the past seven months, material has in this way increased 25 per cent and labor 15 per cent for the higher classes of workmen.

The war vessels presently building and being fitted out on the Clyde are as follows: *Asahi*, 14,250 tons displacement and 15,000 horsepower, for the Japanese Government, by the Clydebank Engineering and Shipbuilding Company; *Sutlej*, 12,950 tons displacement and 13,500 horsepower, for the British Government, by the Clydebank Company; *Baccheute*, 12,950 tons displacement and 13,500 horsepower, for the British Government, by the Clydebank Company; *Aboukir*, 14,000 tons displacement, 18,500 horsepower, for the British Government, by the Fairfield Shipbuilding and Engineering Company; *Cressy*, 14,000 tons displacement, 18,500 horsepower, for the British Government, by the Fairfield Shipbuilding and Engineering Company; *Osprey*, torpedo-boat destroyer, 308 tons displacement and 6,000 horsepower, for the British Government, by the Fairfield Company; *Recruit*, torpedo-boat destroyer, 308 tons displacement and 6,000 horsepower, for the British Government, by the Clydebank Company; a torpedo-boat destroyer, 308 tons displacement and 6,000 horsepower, for the British Government, by the Clydebank Company; *Thistle*, third-class cruiser, 700 tons displacement, 1,300 horsepower, for the British Government, by the London and Glasgow Shipbuilding and Engineering Company; *Africa*, 14,000 tons displacement and 25,000 horsepower (first-class armored cruiser), for the British Government, by the Fairfield Shipbuilding and Engineering Company; *Bedford*, first-class cruiser, 9,800 tons displacement and 15,000 horsepower, for the British Government, by the Fairfield Shipbuilding and Engineering Company; *Monmouth*, 9,800 tons displacement and 15,000 horsepower, for the British Government, by the London and Glasgow Shipbuilding and Engineering Company; *Falcon*, torpedo-boat destroyer, 400 tons displacement and 6,000 horsepower, for the British Government, by the Fairfield Company; *Ostrich*, torpedo-boat destroyer, 400 tons displacement and 6,000 horsepower, for the British Government, by the Fairfield Company; troopship, 6,000 tons displacement and 7,000 horsepower, for the Indian Government, by the Fairfield Company.

Last year (1898) eight war vessels were launched from Clyde yards, with a total displacement in tons of 40,108.

GOVERNMENT SUPERVISION.

The marine department of the Board of Trade has full control over the merchant marine of the United Kingdom. Such control is here carried on by the local officials of that body. They have power to detain ships in cases where the load line or other acts are insufficiently observed; have the superintendence of crews and are examiners of provisions; grant certificates to duly qualified masters and mates; appoint courts of inquiry in cases of collision and wreck, and in general supervise all British vessels entering the port. As to recommendations for its betterment, they have raised the standards of examinations for masters and mates, appointed inspectors for regulating seamen's food, etc.

MATERIAL USED IN SHIPBUILDING.

As to the material used in the construction of ships, an explanation is necessary. The principal part of it is mined and manufactured round about the Clyde area. Some eighteen years ago, not a single steel plate was made in Scotland, and in all the big specifications, but more particularly Government vessels, the name of Cammell & Co., Sheffield, appeared as indispensable to the conditions of the contract for supplying the material. Now, there are in Scotland, but mostly in the Glasgow district, at least a dozen firms which roll all kinds of steel plates and angles and supply the shipbuilders. The present prices of steel plates and angles (iron is now all but obsolete) are as follows: Steel ship plates, $37.10 per ton; boiler plates, $42.58; steel angles, $35.28; iron bars, $37.71; iron ship plates, $36.49; angles, $34.66. Hematite pig iron is now $17.51 per ton, against $12.65 at the same date last year. Pig iron is manufactured near Glasgow. Keen competition, however, is maintained with Middlesborough and other large centers in England and Wales. Of course, in the fitting up of a full-powered first-class passenger steamer a lot of brass and copper is required. Fine wooden fittings are used, and the material is pine and cedar for the decks, etc. This can be obtained in Glasgow at from 8 to 12 cents per square foot. For the internal fittings mahogany, at from 12 to 26 cents, is largely used. Teak wood is indispensable in high-class ships, and the price of it is about 10 per cent higher. United States woods, Canary whitewood, and others, are sometimes preferred by certain ship builders and owners. Most of the woods are imported.

PRICES OF SHIPS AND STEEL.

Coming to the prices of ships, a large question is necessarily involved. So far as the mercantile marine is concerned, the variation is remarkable. The Cunard Line furnishes a good example. The *Campania* and *Lucania*, sister ships, 12,950 gross register tons and 30,000 horsepower each, cost about $2,435,683 each, and could not be built to-day for anything like that money. Two steamers for the Castle Packet Mail service between South Africa and the Cape, built at the same yard as the Cunarders (the Fairfield Shipbuilding and Engineering Company), each about 10,000 tons gross register and 15,000 horsepower, cost some $1,459,950 each, or $145.99 per ton. Other well-appointed passenger steamers, with engines to drive them at from 12½ to 15½ knots, cost about $97.33 to $121.66 per ton; first-class river steamers, from $136.26 to $160.59 per ton; coasting passenger and cargo steamers, from $72.99 to $107.06; and the usual "tramp" of fair dimensions, say from 4,000 to 6,000 tons, at from $37.71 to $51.09 per dead-weight ton. The war vessel, however, comes out heavily in price, according to her class, and the little torpedo catcher, with her small tonnage and great horsepower, heads the list at about $291.99 per ton; then follow the quick dispatch boat at $267.65; belted cruiser, at $257.92; and line-of-battle ship, with heavy armament, such as the *Ramillies*, at $243.32. Sailing vessels are now all but unquoted. Indeed, with the heavy list of nearly 500,000 tons on hand building all over the Clyde shipbuilding area, only two sailing craft (exclusive of yachts) are on the stocks.

WAGES IN SHIPBUILDING YARDS.

The following are the rates of wages ruling in the Clyde shipbuilding and marine-engineering trades, fifty-four hours per week:

Workmen.	Wages.	Workmen.	Wages.
Engineers (general)....per hour...	$0.16	Plumbers (special men engaged)....................per hour...	$0.20
Pattern makers..................do......	.17	Cabinetmakers (general), per hour	$0.17 to .19
Fitters (general, and not on piece-work)........................per hour...	.16	Riveters:	
Turners (iron and steel).....do......	.16	First...per day of 9¾ hours...	3.65 to 4.38
Molders (brass)..................do......	.20	Second ....do......	3.65 to 4.38
Molders (general)...............do......	.17½	Plate setters....................do......	2.19 to 3.04
Boiler makers (on 'stab wages), per hour..............	.18	Plate laborers and adjusters, per day of 9¾ hours................	1.22 to 1.70
Hole borers ('stab)......per hour...	.17	Laborers (general), per day of 9¾ hours................................	.97 to 1.22
Holders-on ('stab).............do......	.16	Brass molders...........per hour...	.17
General iron-workers' wages, not on piece, and engaged by the builders ....per hour...	.18	Cabinetmakers (a large amount of this class of work is done by contract outside the yards), per hour..................................	.17
Ship joiners (members of the Associated Carpenters and Joiners' Society of Scotland), per hour..	.17	Special turners and model makers........................per week...	6.81
Shipwrights (members of the Associated Shipwrights' Society of England and Scotland).......................per hour...	.17	Special metal workers and lofts men........................per week...	10.95
Blacksmiths (members of the Associated Blacksmiths Society of Scotland).............per week...	6.56	General laborers.......per hour...	.11
Hammer men (two trade societies) ....per hour...	.15	Draughtsmen (ship and engineer) on Clyde........per week...	6.08 to 12.16
Holders-on (2)... ....do......	$2.19 to 3.04	Store men (shipbuilding and engineering).............per week...	7.29 to 12.16
		Painters (general) and red-leaders..................per hour...	.13½ to .15

In the riveting trade, one man arranges to do various sections of the shell plating of a steamer for so much, according to the size and weight of the plates, and engages what is known as a "squad."

WAGES OF SEAMEN, ETC.

The average monthly wages paid from the port of Glasgow to seamen, engineers, etc., of every rating vary according to the trade in which the men are employed. On the Atlantic, the royal mail lines—such, for example, as the Cunard, White Star, American, etc.—pay captains, officers, seamen, engineers, etc., special rates, but none of those lines sail from Glasgow. The only regular lines, in fact, sailing between this city and United States ports are the Anchor, Donaldson, and Allan, and the wages in these three companies are as follows, per month:

Captains (according to the size and passenger accommodation of ship and length of service)	$97.33 to	$121.66
First officers	60.82 to	72.99
Second officers	48.66 to	60.82
Third officers	36.49 to	48.66
Boatswains		24.33
Quartermasters		23.11
Ordinary seamen (mail steamers)		19.46
Firemen and stokers	20.68 to	21.28
Coal trimmers, oilmen, etc		19.46
First engineers (many, like the captains, with an annual salary)	87.59 to	116.79
Second engineers	58.39 to	87.59
Third engineers	38.93 to	58.39

In the East India trade, the conditions are somewhat different, as all the leading lines sailing from Glasgow to East India ports, including the City, Clan, and Anchor (eastern port section), employ Lascar seamen, who receive not more that $4 per month. The captains and officers, and also the quartermasters, however, are paid about the same rates as on the Atlantic; the engineers and all employed about the engines and boilers receive 5 per cent less.

Then there is what is known as the ocean tramp steamer. Her mission is to go anywhere and pick up a cargo. Sometimes, she is partly owned by the captain and officers, but under ordinary circumstances the wages in such vessels are from 7½ to 10 per cent less on all ratings compared with the regular lines.

So far as the sailing ship—which is fast disappearing from the sea—is concerned, the rate of pay, of course, varies a good deal, but the average for captains may fairly be stated at from $72.99 to $97.33 per month; first officers, $36.49 to $48.66; seconds, $29.19 to $38.93; and thirds, $24.33 to $29.19.

SAMUEL M. TAYLOR,
Consul.

GLASGOW, *October 20, 1899.*

DOMINION OF CANADA.

The natural maritime situation of Canada is admirable. Its shores are lapped by the two great oceans, while the interior is connected with the oceans by the most wonderful lake system on the globe, mighty rivers, and a canal system unequaled by that of any country of like population.

The whole British Empire, including the United Kingdom and the colonies, has a tonnage of 9,760,043; the United States ranks second, with a tonnage of 1,837,729; Germany third, with a tonnage of 1,572,665; Norway fourth, with a tonnage of 1,542,822; France fifth, with a tonnage of 801,164; Italy sixth, with a tonnage of 730,953; Canada seventh, with a tonnage of 693,782. Russia follows Canada, with a tonnage of 676,540; while Spain ranks ninth, with a tonnage of 506,455. Canadians might be gratified with this showing were it not for the fact that, twenty years ago, Canada ranked much higher than at present. In the year 1878, the tonnage of the Canadian vessels was 1,333,015 tons—nearly twice as great as it is to-day. The tonnage of vessels built in Canada in the year 1875 was 188,098 tons; in 1878, it had fallen to 106,976; and last year, only 278 vessels, with a tonnage of 24,522, were built in Canada. Evidently, while Canada still ranks well in proportion to population as a ship-owning and shipbuilding country, there is nothing in the present situation for Canadians to be proud of. Even during the last year, there was a falling off in Canadian tonnage. There was a decrease of 41 vessels, with a tonnage of 37,972, as compared with 1897. In almost everything else, Canada has made wonderful progress since confederation; but in ship owning and shipbuilding, it has been going backward instead of forward. In the year 1868, one year after confederation, Canadians built ships with a tonnage of 87,230 tons—about four times as much as last year. In the old days, Canadians not only built ships for themselves, but for other nations. Canadian ships were seen in every sea. In the year 1876, the value of Canadian-built ships sold to other countries was $2,189,270; last year, the value was $191,069.

If Canada had made the same progress in shipbuilding that it has made in other industries during the last twenty years, it would rank second among the maritime states of the world.

The reason for the decline is the substitution of steel steamships for wooden sailing vessels. No other country has natural advantages equal to those of Canada for building wooden vessels. With first-class timber, magnificent internal water ways, and extensive seacoasts, there was nothing left to be desired. But when iron and steel were required as raw materials, Canada went out of the business; for until a few years ago, Canada had no iron and steel industries. However, there is no doubt that Canada is as splendidly endowed with the raw materials for making steel as it is with those for wooden ships. During the last twelve years, this industry has been gradually developed, and, although still small, it promises to reach gigantic proportions during the next ten years. There are indications that shipbuilding will develop simultaneously with the iron industry. Already, arrangements have been made to commence building ships in Hamilton on an extensive scale, using steel made there. The Bertram shipbuilding yards in Toronto are to be extended. The company which is to construct the dry dock at St. John, New Brunswick, proposes to establish a shipbuilding yard in connection therewith, and the great Dominion Iron and Steel Company, of Cape Breton, is expected to undertake shipbuilding very extensively in a few years.

PRESENT CONDITION OF MERCHANT MARINE.

On the registry books of the Dominion are 6,643 vessels, steam and sail, of 693,782 tons. The total value of Canada's present shipping is given as $20,813,460.

During the year 1898, 278 vessels of 24,522 tons were built and registered, as compared with 231 vessels of 17,094 tons the previous year. In 1874, at the establishment of the registry of shipping, Canada built 490 vessels of 183,010 tons.

GOVERNMENT POLICY.

The Canadian method of promoting its merchant marine consists of—

First. The navigation and coasting laws, similar to those of the United States, and no doubt of many other nations. These are intended to prohibit foreign vessels sharing in the coasting trade, fisheries, and interior carrying trade of Canada. The coast line for these purposes, of course, extends not only along the Atlantic and Pacific coasts, but to the shores of the Gulf of St. Lawrence and the Canadian shores of the St. Lawrence River and the Great Lakes, making a coast line of immense length with a very large number of ports, many of which are terminals of other navigable rivers and of railway systems or branches thereof.

Second. Bonuses given in the form of postal subsidies or otherwise to a few lines of ocean steamers, such as the Allan Line mail subsidy, the St. John Beaver Line subsidy, the Halifax and West India subsidy.

Third. The Canadian canal system, opening the St. Lawrence route to vessels of 14 feet draft from the sea to the head of Lake Superior, with a number of other minor canals, may be considered a measure for the promotion of the Canadian merchant marine. It has had little effect in this direction hitherto, on account of two circumstances: first, that the Welland Canal extending deep-water navigation from the upper lakes as far as the head of the St. Lawrence canal system was completed to 14 feet depth long ago, while some of the St. Lawrence canals have continued until this year to be of practically not more than 7 feet draft at low water. The consequence has been that the Welland Canal simply afforded an outlet to the United States tonnage from the upper lakes to Ogdensburg or Oswego. The tendency was aided by the admission of American vessels to the canal on equal terms with Canadian vessels, which had always been the practice of the Canadian Government, and which was perpetually secured by the terms of the Washington treaty of 1870. These terms, of course, only apply to through freights, and do not extend to participation in carriage of local freight, which is subject to the navigation laws. These circumstances will be altered, as far as the first cause is concerned, by the completion this year of the St. Lawrence canals to equal depth with the Welland Canal. The equal privileges given by the Washington treaty will then apply to the whole navigation from Lake Superior through the River and Gulf of St. Lawrence. But it is expected that Canadian shipmasters will be encouraged to construct and operate larger tonnage for the extended route to the Canadian seaboard, now made accessible to vessels of 14 feet draft.

The merchant marine is supervised by the Department of Marine and Fisheries, of which Sir Louis H. Davies is at present minister. No special recommendations have been made for aiding its interests, though the bounties to fishermen, which Parliament grants to the extent of $160,000 annually for boats not below 10 nor exceeding 80 tons, are supposed to indirectly aid the merchant marine.

No bounties are given to assist in shipbuilding, but the bounty on the manufacture of pig iron is surely leading to the creation of new enterprises in connection with the iron shipbuilding trade.

To develop a possible steel and iron industry and with the ultimate view of establishing shipbuilding with these materials in Canada, Parliament in 1897 voted a bounty to steel billets and bar and pig iron. This act reads:

60–61 Victoria, chapter 6, June 29, 1897.—On steel ingots manufactured from ingredients of which no less than 50 per cent of the weight thereof consists of pig iron made in Canada, a bounty of $3 per ton.

On pig-iron bars manufactured from pig iron made in Canada, a bounty of $3 per ton.

On pig iron manufactured from ore, a bounty of $3 per ton on the proportion produced from Canadian ore and $2 per ton on the proportion produced from foreign ore.

The said bounties shall be applicable only to steel ingots, puddled-iron bars, and pig iron made in Canada prior to April 23, 1902.

This act was amended at the last session of Parliament as follows:

The bounties on steel ingots, puddled-iron bars, and pig iron made in Canada, authorized by chapter 6 of the act of 1897, shall, on the termination of the period therein mentioned (April 23, 1900), be gradually reduced during a limited term, until they are extinguished, and the bounties to be paid for the additional term shall be as follows:

(*a*) From April 23, 1902, to June 30, 1903, inclusive, 90 per cent of the amount fixed by said act.

(*b*) From July 1, 1903, to June 30, 1904, both inclusive, 75 per cent of previous act.

(*c*) From June 1, 1904, to June 30, 1905, both inclusive, 55 per cent of previous act.

(*d*) From July 1, 1905, to June 30, 1906, both inclusive, 35 per cent of previous act.

(*e*) From July 1, 1906, to June 30, 1907, both inclusive, 20 per cent of previous act.

If steel ingots be made from puddled-iron bars manufactured in Canada, no bounty is to be paid on such steel ingots.

The bounty shall cease and terminate on June 30, 1907.

In order to take advantage of these bounties and to develop the immense deposits of iron ore in Cape Breton, Nova Scotia, in the vicinity of the coal areas, a company, under the leadership of Mr. Whitney (a capitalist of Boston, already largely interested in the bituminous coal mines of Nova Scotia), has been started with a capital of $20,000,000 to build large furnaces and iron works at Cape Breton. Large areas of iron ore and coal lands have been secured here and in Newfoundland, and it is no doubt the intention of the company to manufacture steel and iron ship plates and commence the building of ships of these materials. The decline of wooden-ship building may even induce Parliament to vote a bounty of so much a ton of these vessels built.

GOVERNMENT VESSELS.

No war ships are built in Canada. The Government has 5 small steamers—1 wooden and 4 iron—for buoy and light-house service in the St. Lawrence and on the eastern coast; 1 iron steamer adapted to winter service between Prince Edward Island and the main coast; 1 small steamer, the *Petrel*, employed on the Great Lakes, patrolling the boundary line; 1 small wooden steamer, the *Bayfield*, in hydrographic surveys on the lakes; 6 small steamers for the protection of the Atlantic coast, and 1 small steamer for similar service on the Pacific.

MATERIALS FOR SHIPBUILDING.

The timber and lumber used in the building of vessels here are the product of Canada, but the shipbuilding plates of steel and structural forms for steel vessels are imported. In the past they came mostly from Pennsylvania, at a price of 2¼ cents per pound free on board cars at the place of production. The English and Scotch price of £8 ($38.93) per ton, free on board, was in excess of the American price; but recently the American steel producers have been so overburdened with orders that prices were advanced. At present, purchases are being made in England, the English prices being now the lowest. The price of ship plates delivered in Canada from England at the present time is $2.12½ per 100 pounds; $\frac{5}{16}$ plate, $2.16½ per 100 pounds; ¼ plate, $2.20 per 100 pounds; the price of angles and shapes is $2.50 per 100 pounds.

WAGES.

At the Polson Iron Works, Toronto, the following wages are paid: Riveters, platers, fitters, etc., average about $2.25 per day; laborers, $1.25 to $1.50 per day; wood workers, $2 to $2.25 per day.

The wages paid in shipyards average per day as follows:

Workmen.	Wages.	Workmen.	Wages.
Pattern makers	$1.75 to $2.00	Brass molders	$2.25
Riveters	1.90 to 2.00	Machinists	$1.75 to 2.00
Joiners	2.00	Ship carpenters and painters	1.75
Furnace men	1.75	Riggers	2.00
Plumbers	2.00 to 2.50	Laborers	1.00 to 1.25
Sheet-iron workers	1.75 to 1.90	Iron molders	2.25

The average monthly wages of seamen at the port of Montreal in the foreign trade on steam and sail vessels are:

Class.	Steamers.		Sailing vessels.
	£ s. £ s.		
Able-bodied seamen	4 0 to 4 10	$19.46 to $21.89	$18
Boatswains	5 0 to 5 10	24.33 to 26.76	22
Carpenters	6 0 to 6 10	29.19 to 31.62	25
First mates	12 0 to 16 0	58.39 to 77.86	35
Second mates	7 0 to 8 10	34.06 to 41.35	30
Firemen	4 0 to 5 0	19.46 to 24.33	
Coal passers	3 0 to 4 10	14.59 to 21.89	
Trimmers	3 0 to 4 10	14.59 to 21.89	
Oilers	4 0 to 5 0	19.46 to 24.33	
Greasers	4 0 to 5 0	19.46 to 24.33	
First engineers	17 0 to 21 0	82.73 to 102.19	
Second engineers	13 0 to 17 0	63.26 to 82.73	
Third engineers	9 0 to 12 0	43.79 to 58.39	

I append statistical tables furnished by the Department of Marine and Fisheries.

Vessels on the registry books of the Dominion of Canada on the 31st of December, 1898.

Port.	Total number of sailing ships and steamers.	Number of steamers.	Gross tonnage of steamers.	Total net tonnage of sailing ships and steamers.
Province of New Brunswick.				
Chatham	326	41	1,895	7,219
Dorchester	4	....	....	1,514
Moncton	16	1	20	2,591
Richibucto	16	2	79	2,737
Sackville	14	3	65	1,130
St. Andrews	136	7	273	2,839
St. John	391	63	7,526	71,257
Total	903	117	9,858	89,257
Province of Nova Scotia.				
Amherst	4	....	....	113
Annapolis	53	1	32	5,567
Arichat	125	1	66	5,270
Barrington	45	1	48	1,540
Canso	8	Nil.	Nil.	332
Digby	168	5	229	8,585
Guysboro	22	Nil.	Nil.	877
Halifax	477	59	9,648	25,129
Liverpool	74	2	137	5,336
Lunenburg	291	7	439	23,936
Maitland	20	Nil.	Nil.	17,412
Parrsboro	137	2	201	32,000
Pictou	57	20	1,253	9,684
Port Hawkesbury	81	2	43	2,807
Port Medway	21	1	45	2,049
Pugwash	Nil.	Nil.	Nil.	Nil.
Shelburne	109	2	53	6,181
Sydney	100	9	524	4,400
Truro	2	Nil.	Nil.	160
Weymouth	36	1	21	3,091
Windsor	129	13	2,596	74,567
Yarmouth	208	20	4,412	33,140
Total	2,167	146	19,747	262,175
Province of Quebec.				
Amherst (Magdalen Islands)	16	Nil.	Nil.	619
Gaspé Basin	32	1	709	1,858
Montreal	539	186	55,556	87,593
New Carlisle	11	2	45	249
Percè	Nil.	Nil.	Nil.	Nil.
Quebec	780	133	19,039	54,128
Total	1,378	322	75,349	144,447
Province of Ontario.				
Amherstburg	5	2	28	160
Belleville	24	17	622	935
Bowmanville	3	....	....	607
Brockville	22	21	475	299
Chatham	29	18	883	1,518
Chippewa	3	2	263	153
Cobourg	4	1	23	311
Collingwood	72	70	7,005	5,205
Cornwall	5	4	221	244
Deseronto	19	13	1,383	1,412
Dunnville	1	1	87	57
Goderich	44	27	762	1,967

Vessels on the registry books of the Dominion of Canada, etc.—Continued.

Port.	Total number of sailing ships and steamers.	Number of steamers.	Gross tonnage of steamers.	Total net tonnage of sailing ships and steamers.
Province of Ontario—Continued.				
Hamilton	45	37	6,371	5,097
Kingston	159	69	10,982	23,484
Napanee	1	....	....	122
Oakville	2	....	....	126
Ottawa	340	186	14,790	26,002
Owen Sound	35	33	4,991	3,672
Picton	17	8	1,655	2,054
Port Arthur	11	11	3,116	2,016
Port Burwell	8	4	44	158
Port Colborne	3	2	92	321
Port Dover	13	6	170	692
Port Hope	56	32	2,706	5,500
Port Rowan	6	2	180	513
Port Stanley	7	7	1,164	739
Prescott	37	16	1,141	6,606
Sarnia	29	21	8,405	7,100
Saugeen	12	12	547	374
Sault Ste. Marie	24	24	1,273	977
St. Catherines	93	53	7,506	13,228
Toronto	236	180	15,336	14,763
Wallaceburgh	31	18	1,058	1,945
Whitby	3	....	....	514
Windsor	53	27	6,140	5,309
Total	1,452	924	99,419	134,180
Province of Prince Edward Island.				
Charlottetown	178	21	4,043	15,979
Province of British Columbia.				
New Westminster	108	85	10,203	7,502
Vancouver	95	85	15,796	11,250
Victoria	241	129	26,130	21,552
Total	444	299	52,129	40,304
Province of Manitoba.				
Winnipeg	121	80	6,692	7,439
Summary.				
New Brunswick	903	117	9,858	89,257
Nova Scotia	2,167	146	19,747	262,176
Quebec	1,378	322	75,349	144,447
Ontario	1,452	924	99,419	134,180
Prince Edward Island	178	21	4,043	15,979
British Columbia	444	299	52,129	40,304
Manitoba	121	80	6,692	7,439
Grand total	6,643	1,909	267,237	693,782

Comparative statement showing the number of vessels and number of tons on the registry books of the Dominion of Canada on the 31st of December in each year from 1874 to 1898, both inclusive.

Year.	New Brunswick.		Nova Scotia.		Quebec.		Ontario.		Prince Edward Island.		British Columbia.		Manitoba.		Total.	
	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.	Vessels.	Tons.
1874	1,144	294,741	2,787	479,669	1,837	218,946	815	113,008	312	48,388	35	3,611	....	....	6,930	1,158,363
1875	1,133	307,926	2,786	505,144	1,831	222,965	825	114,990	335	50,677	40	3,685	2	178	6,952	1,205,565
1876	1,154	324,513	2,867	529,252	1,902	228,502	889	123,947	338	50,692	40	3,809	2	178	7,192	1,260,893
1877	1,133	329,457	2,961	541,579	1,951	248,399	926	131,761	342	55,547	43	3,479	6	246	7,362	1,310,468
1878	1,142	335,965	3,003	553,368	1,676	248,349	958	135,440	322	54,250	51	4,482	17	1,161	7,469	1,333,015
1879	1,135	340,491	2,975	552,159	1,975	246,025	1,006	136,987	298	49,807	60	4,701	22	1,924	7,471	1,332,094
1880	1,097	336,976	2,977	550,448	1,889	233,341	1,042	137,481	288	45,931	63	5,049	21	1,992	7,377	1,311,218
1881	1,087	333,215	3,025	558,911	1,830	224,936	1,081	139,998	273	45,410	74	6,296	24	2,130	7,394	1,310,896
1882	1,065	308,980	3,026	546,778	1,754	215,804	1,112	137,061	248	41,684	84	7,687	23	2,783	7,312	1,260,777
1883	1,107	315,906	3,037	541,715	1,739	216,577	1,133	140,972	241	49,446	94	9,046	24	2,778	7,374	1,276,440
1884	1,096	308,132	2,942	544,048	1,628	202,842	1,184	142,387	234	39,213	116	11,403	55	5,722	7,254	1,253,747
1885	1,060	288,589	2,988	541,832	1,631	203,635	1,223	144,487	227	36,040	123	11,834	63	5,439	7,315	1,231,856
1886	1,042	269,224	2,929	526,921	1,650	232,556	1,248	140,929	225	30,658	134	11,900	65	5,578	7,294	1,217,766
1887	1,027	255,126	2,845	498,878	1,586	189,064	1,275	139,548	225	29,031	149	12,789	71	5,871	7,178	1,130,247
1888	1,009	239,332	2,851	485,709	1,498	178,520	1,330	139,502	218	26,586	167	14,249	69	5,744	7,142	1,089,642
1889	1,013	218,873	2,855	464,431	1,455	168,500	1,352	141,839	224	25,506	176	15,241	77	6,091	7,153	1,040,481
1890	981	209,460	2,793	464,194	1,399	164,003	1,312	138,738	231	26,080	196	16,024	79	6,475	6,991	1,024,974
1891	969	193,193	2,778	461,758	1,404	162,330	1,345	138,914	195	23,316	246	19,767	78	6,197	7,015	1,005,475
1892	946	181,779	2,731	425,690	1,408	162,638	1,347	141,750	196	22,706	298	23,448	81	6,118	7,007	964,129
1893	1,010	156,086	2,715	396,263	1,426	161,121	1,370	146,665	188	20,970	315	24,900	89	6,534	7,113	912,539
1894	1,003	136,257	2,710	371,432	1,427	160,590	1,480	148,525	191	19,650	336	26,455	98	6,715	7,245	869,624
1895	975	122,417	2,683	343,356	1,454	158,776	1,508	148,609	190	19,323	346	25,988	106	7,307	7,262	825,836
1896	964	115,506	2,669	317,526	1,469	158,649	1,525	146,522	174	16,540	363	26,622	115	7,934	7,279	789,299
1897	923	103,584	2,204	283,056	1,480	158,077	1,424	135,349	174	15,812	364	28,604	115	7,272	6,684	731,754
1898	903	89,257	2,167	262,176	1,378	144,447	1,452	134,180	178	15,979	444	40,304	121	7,439	6,643	693,782

Ports at which vessels may be registered, showing the number of new vessels built and registered in the Dominion of Canada during the year ended December 31, 1898.

Port.	Total number of sailing ships and steamers.	Total net tonnage of sailing ships and steamers.
Province of New Brunswick.		
Chatham	3	101
Dorchester	Nil.	Nil.
Moncton	Nil.	Nil.
Richibucto	Nil.	Nil.
Sackville	2	48
St. Andrews	2	34
St. John	24	607
Total	31	790
Province of Nova Scotia.		
Amherst	Nil.	Nil.
Annapolis	Nil.	Nil.
Arichat	1	17
Barrington	Nil.	Nil.
Canso	Nil.	Nil.
Digby	3	57
Guysboro	Nil.	Nil.
Halifax	12	274
Liverpool	4	538
Lunenburg	13	1,069
Maitland	1	96
Parrsboro	9	1,388
Pictou	1	29
Port Hawkesbury	Nil.	Nil.
Port Medway	Nil.	Nil.
Pugwash	Nil.	Nil.
Shelburne	5	358
Sydney	7	191
Truro	Nil.	....
Weymouth	1	68
Windsor	4	733
Yarmouth	6	144
Total	67	4,962
Province of Quebec.		
Amherst (Magdalen Islands)	Nil.	Nil.
Gaspé Basin	Nil.	Nil.
Montreal	22	2,461
New Carlisle	Nil.	Nil.
Perce	Nil.	Nil.
Quebec	29	1,678
Total	51	4,139
Province of Ontario.		
Amherstburg	....	....
Belleville	1	6
Bowmanville	Nil.	Nil.
Brockville	2	95
Chatham	Nil.	Nil.
Chippewa	Nil.	Nil.
Cobourg	Nil.	Nil.
Collingwood	1	11
Cornwall	Nil.	Nil.
Province of Ontario—Cont'd.		
Cramahe	....	....
Deseronto	....	....
Dunnville	Nil.	Nil.
Goderich	1	38
Hamilton	1	2
Kingston	Nil.	Nil.
Morrisburgh	6	152
Napanee	Nil.	Nil.
Oakville	Nil.	Nil.
Ottawa	21	882
Owen Sound	3	20
Picton	Nil.	Nil.
Port Arthur	Nil.	Nil.
Port Burwell	Nil.	Nil.
Port Colborne	Nil.	Nil.
Port Dover	Nil.	Nil.
Port Hope	Nil.	Nil.
Port Rowan	2	22
Port Stanley	Nil.	Nil.
Prescott	1	417
Sarnia	1	21
Saugeen	Nil.	Nil.
Sault Ste. Marie	2	7
St. Catherines	1	29
Toronto	9	322
Wallaceburgh	Nil.	Nil.
Whitby	Nil.	Nil.
Windsor	Nil.	Nil.
Total	46	1,872
Province of Prince Edward Island.		
Charlottetown	5	372
Province of British Columbia.		
New Westminster	17	532
Vancouver	26	6,567
Victoria	29	5,129
Total	72	12,228
Province of Manitoba.		
Winnipeg	6	159
Summary.		
New Brunswick	31	790
Nova Scotia	67	4,962
Quebec	51	4,139
Ontario	46	1,872
Prince Edward Island	5	372
British Columbia	72	12,228
Manitoba	6	159
Grand total	278	24,522

New vessels built and registered in the Dominion of Canada during the year ended December 31 in each year from 1874 to 1898, both inclusive.

Year.	New Brunswick.		Nova Scotia.		Quebec.		Ontario.		Prince Edward Island.		British Columbia.		Manitoba.		Vessels built in Canada.*		Vessels which left Quebec.†		Total.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
1874	90	42,027	175	84,480	73	20,796	50	10,797	88	24,634	5	276	....	....	6	7,746	....	....	496	190,756
1875	65	33,483	177	67,106	103	22,825	53	7,760	83	19,838	....	....	....	....	....	....	....	....	480	151,012
1876	61	31,040	194	58,771	51	17,800	47	5,397	62	14,571	1	121	....	....	3	2,721	1	480	420	130,901
1877	54	31,158	219	47,980	62	19,253	28	3,316	62	17,026	2	204	3	48	2	1,943	....	....	432	120,928
1878	56	27,368	166	49,784	46	10,870	30	2,409	38	10,382	2	45	1	15	1	663	....	....	340	101,536
1879	43	19,067	126	39,208	29	7,421	42	2,464	20	5,279	5	788	....	....	....	....	....	....	265	74,227
1880	63	18,896	126	31,257	33	8,219	44	3,610	21	3,359	....	....	....	....	....	....	....	....	271	65,441
1881	57	18,259	150	40,465	56	5,673	54	5,111	15	4,351	2	85	....	....	....	....	....	....	336	74,060
1882	66	16,820	117	26,711	26	6,785	55	4,369	15	3,508	8	1,631	....	....	1	1,029	....	....	289	61,142
1883	72	21,103	202	35,765	42	6,594	34	4,311	17	5,343	5	849	....	....	....	....	....	....	374	74,090
1884	46	12,888	178	42,032	32	3,815	58	4,446	21	5,189	15	675	....	....	....	....	....	....	387	72,411
1885	34	7,736	102	24,703	29	4,556	45	4,509	11	1,707	6	648	....	....	....	....	....	....	240	43,179
1886	34	4,931	93	20,948	27	2,683	52	2,075	12	1,318	8	154	3	98	....	....	....	....	222	32,207
1887	18	2,909	87	12,310	28	2,888	66	2,993	7	601	9	376	8	439	....	....	....	....	224	22,516
1888	32	2,530	116	12,965	23	2,669	62	5,095	12	1,412	18	448	1	11	....	....	....	....	264	25,130
1889	50	4,792	126	19,645	27	3,759	45	3,259	12	1,503	12	840	8	548	....	....	....	....	280	34,346
1890	35	5,572	150	33,907	25	4,880	41	4,917	12	2,008	15	876	7	218	....	....	....	....	285	52,378
1891	43	6,269	130	35,528	46	4,200	44	2,662	5	1,000	41	2,364	3	122	....	....	....	....	312	52,145
1892	21	1,873	105	16,446	34	2,620	34	3,684	9	967	46	2,887	6	296	....	....	....	....	255	28,773
1893	119	2,819	111	15,089	53	4,220	49	4,126	3	634	19	944	8	608	....	....	....	....	362	28,440
1894	40	2,534	128	8,721	55	4,412	64	3,137	3	183	25	1,900	11	356	....	....	....	....	326	21,243
1895	27	714	89	4,762	49	4,335	52	3,732	1	196	18	1,709	14	822	....	....	....	....	250	16,270
1896	24	627	97	7,704	36	3,969	38	1,757	3	111	22	1,466	7	512	....	....	....	....	227	16,146
1897	33	1,738	54	4,259	49	4,227	50	3,850	3	226	26	2,429	16	365	....	....	....	....	231	17,094
1898	31	790	67	4,962	51	4,139	46	1,872	5	372	72	12,228	6	159	....	....	....	....	278	24,522

*New vessels built in Canada which proceeded to the United Kingdom under a governor's pass without being registered.

†New vessels which left Quebec for registration in Germany.

MONTREAL, *September 18, 1899.*

JOHN L. BITTINGER, *Consul-General.*

NEW BRUNSWICK.

The number of vessels owned and employed in the Province of New Brunswick is:

Description.	Number.	Tons.
British.		
Steam vessels	160	192,760
Sail vessels	720	115,316
Sea fishers	155	3,955
Total	1,035	312,031
Other foreign nations.		
Steam	15	25,357
Sail	23	18,919
Total	38	44,276
Grand total	1,073	356,307

The iron steam vessels and the largest wooden sail vessels are built in Europe, and the small wooden sail vessels are built in this Province.

The iron steam vessels and the large wooden sail vessels are mostly in fair condition, but this can not be said of the small wooden vessels (which compose about two-thirds of the whole number).

The large vessels are engaged in trade with Europe and the West Indies and the smaller vessels in the coasting trade.

There is no official or public discussion in regard to the policies of other nations towards merchant shipping. The boards of trade in this district do not seem to take any special interest in the promotion of the merchant marine.

WAGES.

Only ship carpenters are engaged in building vessels in this Province, and they are paid about $2.50 per day.

The monthly wages paid at this port to persons employed in the merchant marine are:

Class.	Wages.	Class.	Wages.
Seamen	$18 to $20	Coal passers	$20
Boatswains	22 to 25	Oilers	30
First mates	30 to 35	First engineers	$75 to 100
Second mates	20 to 25	Second engineers	60
Firemen	25 to 30	Third engineers	45

SHIPBUILDING.

Shipbuilding in the days of the wooden vessels was a great industry at St. John, but since iron-built vessels have taken their place there are but few built in this Province. There were 24 wooden vessels built during 1898, the largest of which was 400 tons; the rest, very small craft.

During the winter season, when the St. Lawrence River is frozen over, there are four different lines of trans-Atlantic steamships plying between this port and European ports, as the harbor at St. John is open the whole year. This is the eastern terminus of the Canadian Pacific Railroad, over which are transported most of the cargoes for said vessels, there being ample terminal facilities.

IRA B. MYERS,
Consul.

ST. JOHN, *September 1, 1899.*

NEWFOUNDLAND.

The merchant marine of Newfoundland comprises a fleet of 20 steam sealing vessels, 10 steam freighters and coasters (the largest being 2,000 tons and the smallest 250 tons register), 50 foreign-going sailing vessels and a number of fishing schooners, used for local purposes, all of less than 100 tons.

The government pays a bounty of $4 per ton for vessels built in the colony. The Minister of Marine and Fisheries surpervises the merchant marine, after a survey by Lloyd's and the government surveyors. There are no war ships built in Newfoundland. There are no reports as to increasing the efficiency of mail carriage by steamships. The merchant marine is not discussed by boards of trade or other organizations. The policy pursued is copied from that of Great Britain. Materials for shipbuilding, plates, and structural forms for steel vessels all come from England. Lumber, spars, etc., are imported from the United States and Canada. The current price of steel plates for the hulls of vessels is 3 cents per pound, and the cost price in England is 2 cents per pound.

The average monthly wages are:

Class.	Wages.	Class.	Wages.
Seamen	$20	Firemen	$25
Boatswains	25	Coal trimmers	20
Carpenters	$25 to 35	Oilers	30
Quartermasters	30	First engineers	80
First mates	50 to 60	Second engineers	$55 to 60
Second mates	35 to 40	Third engineers	45 to 50

MARTIN J. CARTER,
Consul.

ST. JOHN'S, *September 14, 1899.*

NOVA SCOTIA.

The list of shipping recently issued by the Department of Marine and Fisheries gives the total number of vessels for the Dominion of Canada on December 31, 1898, as 6,643, with net tonnage of 693,782, of which there were 1,909 steamers, with gross tonnage of 267,237.

There has been a decrease of 26 per cent in number of ships during the last fifteen years and 59 per cent in the net tonnage employed.

GOVERNMENT POLICY.

A customs drawback is authorized "on materials used in the construction of ships or vessels built or registered in Canada or built or exported from Canada, at the rate of $1.15 per registered ton on iron-kneed ships or vessels classed for fifteen years; at the rate of 85 cents per registered ton on iron-kneed ships or vessels classed for nine years; at the rate of 75 cents per registered ton on iron-kneed ships or vessels classed for seven years; and at the rate of 65 cents per registered ton on all ships or vessels not iron kneed, and on all ships or vessels iron kneed and not classed."

Practically, all steamship lines carrying freight and passengers from Halifax, Nova Scotia, and St. John, New Brunswick, to England and the West Indies are subsidized by the Dominion Government.

The Dominion Government also gives a subsidy of about $126,000 per annum for a weekly mail service to England, the steamers sailing from Montreal and Quebec during the summer months and from St. John and Halifax during the winter months, one of the conditions of the subsidy being that the terminus of the said line of steamships on this side of the Atlantic must be at a Canadian port.

No recent changes have been made in the above policies, except that until two years ago the payment on the mail subsidy was not conditioned, as above stated, upon a Canadian terminus.

The Department of Marine and Fisheries for the Dominion of Canada supervises the merchant marine, but the only recent recommendation made by this department of which I learn was the removal of restrictions "as to deck loads" from "steamships sailing from any port or place in Canada on or before the 12th day of October in each year to any port or place out of Canada."

Coasting privileges are extended to vessels of nations which extend like privileges to ships of British register, but are denied to others.

The Board of Trade of Halifax has discussed the subject of the merchant marine only with reference to marine insurance, and to prevent discrimination against this port as compared with other Canadian ports.

Plates and structural forms for steel vessels are produced only to a very limited extent at New Glasgow, Nova Scotia.

WAGES.

The average daily wages paid at Halifax, Nova Scotia, for the under-noted kinds of labor are as follows:

Iron workers	$2.00 to $2.50
Machinists	2.50 to 3.00
Riveters (generally piecework)	3.00
Ship carpenters	2.50
Joiners	2.25
Riggers	2.25 to 2.50
Painters	2.00
Sheet-iron workers	1.75 to 2.00
Laborers	1.25 to 1.50
Iron molders	2.00 to 2.25

The average monthly wages paid in the foreign trade on steam and sail vessels, apparently irrespectively of nationality of ship, when seamen are shipped at the port of Halifax, are:

Able seamen	$18 to $20
Boatswains	20 to 25
Carpenters	30 to 35
Quartermasters	22 to 25
First mates	25 to 45
Second mates	20 to 30
Firemen	25
Coal passers	20 to 22
Oilers	28
First engineers	90 to 100
Second engineers	60 to 65
Third engineers	40 to 45

The cost of maintenance is given at from 30 to 36 cents per day, and masters are usually allowed about these sums for the maintenance of their crews.

JOHN G. FOSTER,
Consul-General.

HALIFAX, *October 21, 1899.*

MEXICO.

I have interviewed the Minister of War and Marine of this Republic, and quote his answers to the questions set forth in Department circular of June 20, 1899:

The merchant marine of Mexico consists of 266 ships, with a total of 17,046 tons register, as follows: Forty-one steam vessels of 6,731 tons and 225 sailing vessels of 10,314 tons.

There are no ships built in this country, except small merchant vessels of less than 100 tons.

To encourage the nationalizing of foreign ships under the Mexican flag, the Government has permitted them to register without giving the bonds which were formerly required; and with the view of promoting the shipping industry, the Government has a dry dock in Veracruz and a skid in Guaymas, with exceedingly low tariffs. The dry dock in Veracruz can take a ship of 1,500 tons displacement, and the skid at Guaymas can take a ship of 600 tons.

The Government is studying what can be done to improve the present laws.

Mercantile matters are now divided among different departments, but a department to have exclusive charge of them is projected.

On January 23, 1892, a commission was named by the Secretary of Communications and Public Works to study the cause of the decline of the merchant marine and a way to better it. The following questions were discussed: (1) Different right of flags; (2) pilotage; (3) help, aid, and assistance; (4) exemption; (5) special privileges; (6) smuggling. The commission made its report September 1 and October 1, 1892.

All Mexican mail is carried in foreign bottoms.

No attention has been given to the policy of any foreign nation.

The few chambers of commerce that exist in this country have not interested themselves in the merchant marine.

Wages paid are variable.

ANDREW D. BARLOW,
Consul-General.

MEXICO CITY, *August 2, 1899.*

COSTA RICA.

No shipbuilding of any kind is done in Costa Rica. The coasting trade is carried on by vessels of foreign nations, principally Italian. A few vessels of foreign build have been purchased and put under the Costa Rican flag; but none, so far as I can learn, have ever been built in the country.

In this connection, I will say there is in Costa Rica a kind of cedar (cedro pochote), a very hard, durable wood that would be valuable in the construction of ships, as planks for decks, etc. I am informed on high authority that this wood retains its sap for many years, and after being submerged for a long time is still sound and uninjured by worms or other marine animals.

Should samples of this wood be desired, they can be obtained free of expense upon application to the Costa Rican Government.

JOHN C. CALDWELL,
Consul.

SAN JOSÉ, *September 16, 1899.*

GUATEMALA.

Referring to Department circular of June 20, 1899, concerning merchant marine of foreign countries, I have to report that there is absolutely no shipbuilding or ship ownership in this Republic, and that there is nothing under any of the headings of the circular upon which a report could be made.

A. M. BEAUPRÉ,
Consul-General.

GUATEMALA, *July 26, 1899.*

SALVADOR.

In answer to the questions contained in circular "Merchant marine of foreign countries," dated June 20, 1899, I would state that there is but one boat in the Republic of Salvador that floats the flag of this Government; its name is the *Cuscatlan.* It is unfit for sea service; it was formerly used by the Government as a revenue cutter.

There is no building of boats or ships in Salvador.

JOHN JENKINS,
Consul.

SAN SALVADOR, *July 26, 1899.*

ANTIGUA.

Antigua possesses no merchant marine. Her only pretense of shipping consists of a number of droghers—*i. e.*, lighters—fishing schooners, and fishing smacks, which are built on the beach by carpenters and seamen, at an average wage of 1s. 6d. to 2s. (36 to 48 cents) per diem.

HENRY M. HUNT,
Consul.

ANTIGUA, *July 19, 1899.*

HAITI.

There exists no merchant marine here, if we except the three small steamers of 146 tons, built at Glasgow, Scotland, that formerly plied weekly between this city and the cities and towns on the coast, but have recently been running to Santiago de Cuba.

No measures whatever have been taken by the Haitian Government to promote its merchant marine, nor are there any laws or regulations governing seamen's wages.

JOHN B. TERRES,
Consul-General.

PORT AU PRINCE, *September 18, 1899.*

MARTINIQUE.

"Merchant marine" has no existence at Martinique in the strict sense of the term, what there is being of little or no importance, consisting of small one-masted (bamboo) sailing vessels, called "droghers," having a capacity of 5 to 6 tons, which transport merchandise between the smaller ports of the island.

Between Fort-de-France and St. Pierre, a distance of about 16 miles, communication is carried on by means of a line of small steamers making trips daily, used, however, more as passenger boats than for the transportation of merchandise.

There is no department in the colonial government supervising the merchant marine.

Mail service to and from Martinique is effected by the Compagnie Générale Transatlantique, sailing from France trimonthly; the Royal Mail Steam Packet Company, sailing from England bimonthly; and the Quebec Steamship Company, leaving New York bimonthly.

Chambers of commerce and like organizations never discuss the subject of merchant marine.

Materials for shipbuilding are not imported here. Lumber, occasionally used for repairing small vessels, comes from the United States and Canada.

There is no current price for steel plates here. No shipyards exist; therefore, there is no schedule of wages paid.

I might in this connection speak of the dry dock at Fort-de-France, whose dimensions are as follows: Length, 120 meters (393⅓ feet), 419 feet at the exterior groove; length of blocks, 360½ feet; width, 112½ feet; draft of water above the line of the tub, 27⅛ feet;

charge to enter dry dock, 2 francs (36.6 cents) per ton; charge to make fast, 92 centimes (17.76 cents) per ton; charge for sojourn, 50 centimes (9.65 cents) per ton per day. A reduction of 25 per cent on these charges is made to French vessels and men-of-war of other countries.

GEO. L. DARTE,
ST. PIERRE, *July 19, 1899.* *Consul.*

DUTCH WEST INDIES.

The merchant marine of this island and colony is very limited, being confined to a few sloops and small two-mast schooners plying between this port and the other islands of this colony—Buen Ayre, Aruba, St. Eustatius, St. Martin, and Saba—including trips to the neighboring ports of Venezuela and occasionally to some other island of the West Indies.

The Government leaves its merchant marine to take care of itself, and has apparently no policy with reference thereto.

Formerly, schooners up to nearly 100 tons and from that down to the smallest sloop were built here. Only the smaller vessels of 25 tons or less are built now. In some years, none are built; in others, two or three. The material is of the following origin: Frames, Venezuelan hard wood; all other lumber, from the United States; nails, bolts, chains, anchors, and copper sheathing, mostly from England, occasionally some from Germany. Price mainly determines the purchase, though there is some prejudice against the American product. The spars, sails, oakum, tar, pitch, and everything else that enters into the construction comes from the United States.

The wages paid to ship carpenters are ordinarily about 60 cents a day. While labor is cheap, everything else is dear, and the advantage on the whole is rather against than with Curaçao.

The fleet is owned mostly in Curaçao, and sailed by Curaçao masters. The vessels are manned almost, perhaps quite, exclusively by Curaçao negroes. Wages are: Mates, $16 to $18 a month; seamen, $10 to $12. Considerable numbers of Curaçaoans are employed as firemen and coal passers on the various steamship lines, the Red D included. They get from $12 to $21 a month.

ELIAS H. CHENEY,
CURAÇAO, *October 24, 1899.* *Consul.*

CHILE.

CONDITION OF MERCHANT MARINE.

The merchant marine (sailing vessels) of Chile consists of 2 iron vessels trading to Europe and 84 wooden vessels, including 5 whalers. The vessels not engaged in the European trade are employed on the west coast of America and to Australia, carrying coal from the southern coal districts of Lota and Coronel to Valparaiso and to the northern ports of Chile; nitrate of soda to San Francisco, Cal.; Oregon-pine lumber from Puget Sound to Chilean, Peruvian, and Australian ports; native lumber from the Guaytecas and Chiloé Islands and the southern ports of the continent to Valparaiso and to the northern ports of the coast of Chile. Nearly all of the merchant fleet of sailers are condemned vessels of American and European nationalities, which have been purchased in Chile and repaired. No Chilean coast sailing vessel has ever been built to order.

The steam fleet of Chile numbers 49 vessels, including 18 excellent boats of the Compañia Sud-Americana de Vapores. The steamers of this line were all built on the Clyde, Scotland; they run from Puerto Montt, in the south of Chile, touching at all important ports on the coasts of Chile, Peru, Ecuador, Colombia, and Central America, to Ocos, in Guatemala. This company paid a dividend of 10 per cent for the half year ended June 30, 1899.

The Compañia Esplotadora de Lota y Coronel owns 5 steamers, which carry coal to the northern ports from Lota and copper ores to the south for smelting. There are 5 steamers belonging to different owners trading on the coast under the Chilean flag, and a considerable number of small tugs and launches.

GOVERNMENT POLICY.

The Government grants a subsidy to the Compañia Sud-Americana de Vapores, upon condition that the mails shall be carried free in the steamers and that in the event of war with a foreign country the steamers shall be handed over to the Government, which assumes responsibility in the event of loss or capture by the enemy, and pays cost of maintenance during war time, as well as a certain amount agreed upon for the hire of these vessels. Although the Government, to a certain extent, protects the boats of the Compañia Sud-Americana de Vapores and other steamers, little or no protection is given to sailing ships, which are obliged to pay yearly hospital dues the same as vessels of other nations.

Many attempts have been made by shipowners during the last twenty years to establish the law of "cabotaje," that is, to prohibit any vessel not under the Chilean flag from trading between ports on the coast of Chile; but the strong influence brought to bear on the Government by owners of mines and nitrate works on the coast, who charter ships for freighting coal, lumber, hay, provisions, mules, cattle, etc., for the barren northern districts where minerals are worked, has up to the present prevented serious legislation tending toward the better protection of Chilean steam or sailing vessels. Judging from the earnings of Chilean steamers, they do not appear to require more protection than they at present enjoy; but sailing ships do not pay on the coast, owing to the very low current freights which are payable in Chilean currency, and the delay in loading and discharging, which is a great drawback. Steamers recover freights in the gold peso of Chile, worth 36½ cents American gold. Foreign ships may call at and load in any port of entry on the coast of Chile and carry cargo so loaded to any other port of entry on the same coast; this enables foreign ships to compete with Chilean to a very serious extent. Under such conditions, Chile can never hope to have a prosperous fleet of sailing vessels.

SUPERVISION OF MERCHANT MARINE.

The maritime governor resident in Valparaiso and his subordinates, the captains of the ports in all the other Chilean ports, supervise the merchant marine. From time to time, suggestions have been made to the Government by the maritime authorities, but the only one of real importance being that concerning the law of "cabotaje," they were not entertained. It was considered by the most efficient Chilean naval officers that if the merchant navy, especially that consisting of sailing vessels, were protected and encouraged by granting Chilean ships the sole right to trade on this coast, the merchant navy would become a nursery for the training of seamen for the Chilean navy.

I have not heard that any Parliamentary or official committee reports have been issued on the subject of the merchant marine; but, as stated before, arrangements have been made to convert Chilean mail steamships into armed cruisers for auxiliary naval purposes.

The Chilean policy toward the merchant marine is based chiefly upon the maritime laws of Great Britain and France.

The chambers of commerce do not discuss the subject of the Chilean merchant marine, confining themselves to business connected with foreign trade and shipping interests. No boards of trade exist.

WAR SHIPS.

No war ships have ever been built in Chile, with the exception of two or three torpedo boats which were sent from Great Britain in sections and put up here.

MATERIALS FOR SHIPBUILDING.

All steel plates for boilers are imported. Good boilers of any dimensions are made in Chile. No steel plates are imported for hulls, as none are built, excepting occasional launches of from 50 to 200 tons burden, for use in the Bay of Valparaiso.

Fluctuations in price are marked, owing to recent heavy rise in cost of material in Europe. No certain price can at present be given.

WAGES.

The following wages are given in American gold coin:

Workmen.	Wages.	Workmen.	Wages.
Carpenters per month	$23.00	Riveters per day	$0.85 to $1.35
Joiners do	23.00	Plumbers do	1.00 to 1.65
Furnace men do	11.50	Sheet-iron workers do	1.00 to 1.65
Riggers per day	1.65	Iron molders do	.70 to 1.35
Ship laborers do	*1.00	Brass molders do	1.00 to 1.65
Pattern makers do	1.65	Laborers on shore do	.50 to .75
Machinists do	$1.00 to 1.65		

*And food.

The average monthly wages of seamen, in American gold equivalents, are:

Class.	Wages.	Class.	Wages.
Able seamen	$10.00	Coal passers	$8.25
Boatswain	16.50	Oilers	14.85
Quartermaster and cockswain	11.50	Donkey men	19.80
Chief mate	41.50	Chief engineer	82.50
Second mate	33.00	Second engineer	49.50
Third mate	26.40	Third engineer	33.00
Firemen	11.50		

JOHN F. CAPLES,
Consul.

VALPARAISO, *October 16, 1899.*

ECUADOR.

In reply to circular of June 20, 1899, respecting the merchant marine, I have to state that there is none in Ecuador worthy of mention, and that as yet no measures have been taken to create one.

The merchant marine of Ecuador in 1898 consisted of the following vessels:

Description.	Number.	Tons.
River steamers	19	1,098
Sailing vessels	229	3,334
Canoes and rowboats	31	119
Total	279	4,651

PERRY M. DE LEON,
Consul-General.

GUAYAQUIL, *July 25, 1899.*

THE GUIANAS.

Referring to Department circular of June 20, concerning the merchant marine of foreign countries, I have to state that the colonies embraced in this consular district have no merchant marine apart from the respective governments under whose jurisdiction they are.

GEO. H. MOULTON,
Consul.

DEMERARA, *July 22, 1899.*

PARAGUAY.

The Government owns two small launches, which ply along the river coast and are used principally by the customs officers in visiting the custom-houses along the river. They are named *Stapirú* and *Teniente Herreros.*

There are passenger and cargo vessels flying the Paraguayan flag, owned by several private companies, namely: The *Leda*, which goes to Corrumba; the *Pollux*, which carries cattle; the *Albatros*, which carries fruit; the *Villa Florida* and the *Scala II*, which go to Villa Florida; the *Asuncion* and the *Aurora*, which go to Villa Concepcion; the *Oneta*, which runs to Villa Concepcion; the *Angelica Ramonia;* the *Salvador*, cattle boat; and the *Cetinge*, which goes down the river for passengers when the water is very low.

There are 5 or 6 sailing vessels of 200 to 250 tons, which carry wood.

About 100 flat-bottom boats, with a total capacity of 250,000 arrobas (6,250,000 pounds), bring yerba mate to Asuncion.

A fleet of perhaps 10 sloops, of from 50 to 60 tons, runs to Risso Colony.

The Government pursues no policy to promote the merchant marine, and is not engaged in building war ships.

The chamber of commerce here has never discussed the merchant marine.

There are no shipyards; in fact, Paraguay has no merchant marine in the full sense of the word.

JOHN N. RUFFIN,
Consul.

ASUNCION, *September 2, 1899.*

URUGUAY.

The merchant marine of Uruguay is almost wholly comprised of coastwise or river boats—steam and sail—there being but three sailing vessels of record for over-sea service, these having changed from the Spanish flag during the late war with that country: the *Montornes* (bark), 786 tons; *Francisca Nadal* (bark), 400 tons; and *Maria* (schooner), 148 tons. The steam transports running between Montevideo and Buenos Ayres and up-river ports number 12, the largest having a registered tonnage of 1,166 tons.

GOVERNMENT AID AND SUPERVISION.

No special policy has been adopted by the Government of Uruguay to promote the merchant marine, by reason of the great scarcity of shipbuilding timber, all of which has to be imported from Paraguay, making the construction very expensive. Nor can ironwork be done, as all such material must be brought from Europe or the United States and undergo very heavy duties. Were it not for these conditions, the Government would aid in the creation of a merchant marine, but not to the extent of granting a bounty on tonnage. It does grant an exemption from certain port charges, and makes matters in that direction quite satisfactory to those interested in the financial success of the vessels and the capital involved under their flag. It expedites foreign mails and adopts all available means to assist the merchant marine. With the construction of the port works, it is proposed to try a new line of encouragement. As it is now, the open roadstead affords but little protection against the "pampero" gale to ships of any size, all the smaller craft finding reasonable shelter inside. The new port works will provide extensive breakwaters and a sheltered harbor, and it is thought that an enlargement of deep-sea commerce under the Uruguayan flag will be brought about. No war ships are built.

The superintendence of the merchant marine is in charge of the captain-general of ports, and his office is an appendage of the Navy Department. Latterly, the captain of the port has been an officer of this branch of Government.

Commercial bodies, as such, do not act on the subject of the merchant marine. That is left for individual enterprise, and so far the method has been quite successful, when the conditions in general are considered.

WAGES.

As to wages for ship workmen, the rates can be given only for those employed at repair works, and they are as follows, per day and week:

Workmen.	Per day (10 hours).	Per week (60 hours).
Pattern makers	$2.00	$12.00
Machinists	2.00	12.00
Riveters	1.70	10.20
Ship carpenters	2.25	13.50
Joiners	2.25	13.50
Painters	2 00	12.00
Furnace men	2.50	15.00
Riggers	1.60	9.60
Plumbers	2.00	12.00
Sheet-iron workers	2.00	12.00
Molders, brass and iron	2.00	12.00
Laborers	1.00	6.00

The wage list for men signing for foreign trade is now current as follows, per month:

Class.	Wages.	Class.	Wages.
Able seamen	$20	First engineers†	$65 to $80
Boatswains	22	Second engineers	50 to 65
Carpenters	25	Third engineers	25 to 35
Quartermasters	22	Firemen	22 to 25
First mates (sail)*	$40 to 50	Coal passers	20 to 24
Second mates (sail)*	25 to 35	Oilers	22 to 25

* Varying as to schooner, bark, or ship. † Varying as to class and tonnage of steam vessel.

These wages are given from signed American and English articles, and are the highest paid in this port. Lower wages are paid on the French, German, and Italian lines, in the order named. In the sailing vessels, the lowest wage is paid on Norwegian ships.

GENERAL.

It should be stated here that the duties levied on all shipbuilding material are excessively high. Thus, on steel plates imported for repair purposes (tested and certified material), the market price is $9.30 per 100 kilograms (220 pounds), with only a fair allowance for handling them by way of profit. These rates make repairs exceedingly costly in this port, for that reason alone.

Submitted with this report are the general regulations of the port, the rules as to salvage, and other matters of pertinent interest, in Spanish, which have been kindly furnished by Col. Carlos Gaudencio, captain of the port, upon request.* Also is submitted the list of vessels registered under the Uruguayan flag, as follows:

Description.	No.	Tons.
Steam vessels	18	6,322
Sailing vessels	81	9,186
Total	99	15,508

Merchant vessels under Uruguayan flag.

Class	No.	Tons.
Sailing vessels:		
Barks	1	786
Corvettes	1	400
Polacres	1	148
Schooners	40	2,091
Tenders	11	1,248
Packet boats	80	3,128
Sloops	25	469
Cutters	6	151
Smacks	12	520
Flat-bottom boats	3	219
Steamers	18	6,312

ALBERT W. SWALM,
Consul.

MONTEVIDEO, *October 17, 1899.*

---

* Transmitted to the Commissioner of Navigation.

CAPE COLONY.

The British colonies in South Africa have no merchant marine and depend entirely upon that of the mother country; consequently, no reply can be issued from this consulate to the first eight questions propounded in Department circular. To the ninth question, I may say that the average monthly wages are not fixed here. only common seamen being engaged to fill vacancies, the regular wages being £3 10s. ($17), but more frequently £3 ($14.60) being paid.

J. G. STOWE,
Consul-General.

CAPE TOWN, *August 1, 1899.*

ZANZIBAR.

There is no merchant marine, properly speaking, in this country; the only merchant craft being two small steamers owned by the Sultan of Zanzibar, about 200 tons register, twenty years old, and native dhows built of wood, with capacities of 20 to 100 tons each.

A. L. SARLE,
Acting Consul.

ZANZIBAR, *August 21, 1899.*

BRITISH INDIA.

Calcutta is one of the largest and most important seaports of the world. In the year 1897-98, 1,102 seagoing steamers, with a gross tonnage of 3,311,415, entered the port, and 1,097 such steamers, with a gross tonnage of 3,275,685, left it; besides, 135 sailing ships of 250,958 gross tonnage visited the port, and 126 of 232,586 gross tonnage went out. Many ships arrive and depart from other large ports, such as Bombay and Madras. Nevertheless, India has no merchant marine. There are no ships built in India, but the larger proportion—in fact, nearly all—of the steamers and sailing ships arriving at and departing from her ports are under the British flag.

As India is a part of the British Empire and is protected by the British navy, there are no war ships built or owned by the Indian government.

R. F. PATTERSON,
Consul-General.

CALCUTTA, *July 26, 1899.*

DUTCH INDIA.

The merchant marine of Netherlands India, by which I mean solely those ships trading in these waters and not those which ply between here and Holland (these being registered in Holland), consists of 249 ships, of which 76 are steamers, with a total registered tonnage of 83,305 net. A large amount of trading is done, and the carrying trade of this colony is reckoned a fairly prosperous one, although, of course, not so good as formerly.

GOVERNMENT POLICY AND SUPERVISION.

The only policy pursued by the Government to encourage the local merchant marine is to prohibit trade between ports in this colony by any ships except those flying the Dutch flag, a policy practically similar to our own. In addition, a subsidy running for fifteen years of $164,000 a year is paid (it was formerly $280,000 a year, but the new contract has just been completed for the lesser sum) to the Koninklijke Paketvaart Maatschappij. For this subsidy, it is obliged to maintain a reasonably frequent mail, freight, and passenger service between all the ports, large or small, of Netherlands India. This it faithfully does; it is universally admitted that in service, cleanliness, and quick dispatch the company is equal, if not superior, to any in the East.

No subsidy is granted to any other ships. The Home Government has mail contracts with the Stoomvaart Maatschappij Nederlandsch and the Rotterdamsche Lloyd for carrying the mails between here and Holland. The first-named line has 14 steamers, with an aggregate tonnage of 43,811. The latter company has 14 steamers, with an aggregate tonnage of 35,711.

There has been no recent change in policies, and, so far as is known, none is contemplated.

There are no war ships built in this colony, and no iron or steel ships. Small wooden schooners are built here, and occasionally a steam launch.

The department having nominal supervision of the local merchant marine is the Department van Onderwijs, Eeredienst en Nijverheid (Department of Education, Public Worship, and Industry), but any change in the laws must come from Holland, the authorities here being empowered only to make such administrative regulations as are necessary for enforcing the existing laws.

The best and, in fact, the only literature I know of bearing on the question of the merchant marine is the official report of the debates in the Dutch Parliament* during last January and February, while the new mail subsidy to the Koninklijke Paketvaart Maatschappij was being discussed. I am unable to procure any copies of these, the only ones here being those subscribed to by libraries, clubs, and Government offices. They are, however, readily to be procured at The Hague. I read many of the debates at the time they were published, and some of the speeches of members were excellent and discussed the question of marine subsidies very exhaustively.

No attention is paid here to foreign policies. There is no place in the world, except China, where the people are more independent of foreign suggestions and precepts.

MATERIALS FOR SHIPBUILDING.

The steel and other plates for repairs in the dockyards are all imported from Europe; the lumber with which the small vessels are built is indigenous and is mostly teak.

The Government and the dock company import only for their private use, and there are no public quotations; the prices they pay are presumably contract prices made in Europe.

WAGES.

The following are the wages paid to the laborers, skilled and unskilled, in the shipyard and dry dock here:

Workmen.	Chinese.	Native.
Pattern makers	$1.28	$0.80
Fitters or machinists	1.90	.48
Ship carpenters	1.10	.68
Joiners	1.10	.68
Painters	.60	....
Coppersmiths and plumbers	1.52	.96
Boiler makers, riveters, and sheet-iron workers	1.88	.48
Molders, iron and brass	1.68	.48
Laborers	.60	.30
Smiths	1.70	.80
Helpers	.48	.40
Turners	1.90	.80
Machine men	....	.52

These wages are per diem and are the average rather than a fixed schedule. There is no European manual labor, as no white man could stand it in this climate.

The following are the average monthly wages paid by ships here for men. There is no way of getting exact figures, as the captains make their own bargains, and these depend entirely on whether there happens to be a glut or scarcity of sailors looking for employment.

---

* Verslagen der Staten-Generaal.

Class.	Wages.	Class.	Wages.
Mates:		Carpenters:	
Steam	$60 to $80	European—	
Sailing	25 to 30	Steam	$30
Second mates:		Sailing	25
Steam	40 to 48	Native	$9 to 12
Sailing	15 to 20	Quartermasters (steam):	
Third mates (steam)	32 to 40	European	20 to 25
Fourth mates (steam)	24	Chinese	15
First engineers	100 to 140	Native	9 to 12
Second engineers	60 to 80	Apprentices (steam and sail):	
Third engineers	48 to 56	American ships	10
Fourth engineers	32 to 40	French ships	8
Stokers:		Other nations	Nothing.
European	18	European able seamen (steam)	12 to 16
Chinese	10	European ordinary seamen (sailing)	8 to 12
Boatswains:		Native Serang (chief)	12
Steam	20 to 25	Native ordinary	5
Sailing	17 to 19		

These figures include food.

In general, it may be said that American ships pay their men best, then Dutch and English ships, then French and German, and lowest of all Italian and Scandinavian.

The best paid of all the steamship lines coming here is the Dutch line Koninklijke Paketvaart Maatschappij; its wages are the maximum ones I have given in the table.

SYDNEY B. EVERETT,
Consul.

BATAVIA, *September 15, 1899.*

HONGKONG.

I do not think that the colony of Hongkong can strictly be said to possess a "merchant marine." All the legislation regarding shipping is formulated to control rather than to foster the vast fleets that come here under all flags. The only tax on shipping is a small light due, and even that has been reduced within the last year. The annual report of the harbor master deals merely with the tonnage and the number of ships entering and leaving this port. There are no sailing vessels built in this port, other than river junks for Chinese. I am unable to learn of any policy that is pursued by this colonial government to promote a merchant marine; in fact, I have failed to find any good reason why it should. There are no war ships built here. One English firm owns all the dockyards, and the only boats it builds are river launches and very small steamers. The labor employed is Chinese, under skilled European supervision. This firm, which owns the Hongkong and Whampoa Dock Company, is capable of docking the largest vessels and of carrying on extensive repairs.

ROUNSEVELLE WILDMAN,
Consul-General.

HONGKONG, *August 18, 1899.*

STRAITS SETTLEMENTS.

Singapore, one of the greatest ports in the world, is dependent on the merchant marine, local and general, for its very existence, so the importance of that marine can not be overestimated. With the exception of a few fruits grown on the island, all food stuffs, clothing, machinery, material, coal—in fact, almost all mentionable articles—are imported. The local shipping is fully employed collecting native produce and distributing English goods among the ports of the native states, India, Burma, Sumatra, Java, Borneo, Western Australia, Siam, and China. The condition of the merchantman here is similar to that obtaining in Great Britain. The board of trade officers survey the vessels and see that they are kept up to the standard. The number of local vessels clearing from the port daily is from 10 to 12.

The government does not assist the merchant marine in any way; the imperial merchant shipping acts are applicable here when adopted by the legislative council, and the British shipowner has to comply with their provisions. In saying the government does not assist the shipowner, I do not imply that it is antagonistic to shipping interests, but merely that its attitude is passive.

The supervision of the merchant marine is in the hands of the master attendant and his staff.

Owing to the capsizing in a squall of a small local steamer some two and a half years ago, the government appointed a shipping commission to inquire into the working of the several shipping acts in force and to suggest any amendments they might think necessary. The suggestions made, which concerned the number and disposal of the passengers on board ship, were embodied in a bill which the legislative council passed; but, owing to the strong objections from local owners, it has not been put in force. Surveyors, however, have received orders to look more carefully after deck loads.

The chamber of commerce, composed of the leading merchants in the town, concerns itself with general trade matters, and has not taken up the subject of the mercantile marine in any special way.

The artisans are altogether natives—Chinese, Malays, or Indians—and they are paid from 50 cents to $2 silver a day, according to their skill. Laborers earn from 15 to 50 cents silver per day.

The monthly wages of seamen, boatswains, and quartermasters, who are all natives—Chinese, Malays, or Indians—is from $8 to $15 a month, with a certain rice allowance. Carpenters (mostly Chinese) receive from $15 to $25 silver (about $7.50 to $12.50 gold) a month, with rice allowance. Firemen, oilers, and coal passers receive from $10 to $20 ($5 to $10 gold) a month, with rice allowance. First mates, $100 ($50 gold); second mates, $75 ($37.50 gold); first engineers, $240 ($170 gold); second engineers, $150 ($75 gold), and third engineers, $100 ($50 gold) a month, with $30 ($15 gold) a month in each case for messing.

R. A. MOSELEY, Jr.,
Consul-General.

SINGAPORE, *September 15, 1899.*

JAPAN.

CONDITION OF MERCHANT MARINE.

At the close of the fiscal year ended June 30, 1898, there were 970 steamers (438,348 tons), 714 sailing vessels of foreign style (48,111 tons), and about 17,737 sailing vessels of Japanese style (312,478 tons), showing an increase of 117 steamers and 65,050 tons, 71 sailing vessels of foreign type and 4,076 tons, and 132 sailing vessels of Japanese type and 6,158 tons.

Of steamers above 1,000 tons measurement, there are now (October, 1899) 149, with a total tonnage of 380,619, of which 60 steamers of 191,343 tons are owned by the Nippon Yusen Kaisha (Japan Mail Steamship Company) alone. In the foreign trade, the tonnage of Japanese steamers now reaches about 250,000 tons.

GOVERNMENT AID TO MARINE.

State aid, under the navigation-encouragement law, is now enjoyed by 30 steamers of 137,603 tons, two-thirds of which are vessels of the Nippon Yusen Kaisha.

This law came into force October 1, 1896, and provides that Japanese-owned steamers of over 1,000 tons, of a speed exceeding 10 knots, shall receive a bounty of 25 sen (about 12 cents) per ton for the first 1,000 knots run and one-tenth of the same rate for every additional 500 knots.

More recent legislative grants are special subsidies of $1,331,600 for the Nippon Yusen Kaisha line from Japan to Europe, $325,707 for the same company's Japan–Seattle line, and $504,912 for the Toyo Kisen Kaisha's Japan–San Francisco line. The payments are to continue for a period of ten years from January 1, 1900. For the European service, which is to be fortnightly, 12 steamers of not less than 6,000 tons gross, with a minimum speed of 14 knots an hour, are to be furnished. For the service between Hongkong and San Francisco, which is to take place at least once every four weeks, 3 steamers of not less than 6,000 tons gross tonnage, with a minimum speed of 17 knots an hour, are required; and for the Hongkong–Seattle line, 3 steamers are provided for, with a gross tonnage of not less than 6,000 tons each and a speed of not less than 15 knots an hour, which shall make at least thirteen trips a year. The subsidy is to be granted for vessels which shall be engaged in these services for ten consecutive years, the proportion they are to receive being the same as that to which they are entitled under the laws for the encouragement of navigation, the provisions of which must be observed. The steamers must be less than fourteen years old when the contract takes effect and must pass the necessary official examination. Postal matter is to be conveyed free of charge. During 1898, the Nippon Yusen Kaisha added 6 vessels (5 of which were built in England), aggregating 34,724 tons, to the fleet; and it has now 12 steamers of a gross tonnage of 73,623 tons on the European line and 6 steamers averaging 3,000 tons each on the Australian and American lines. In addition, another Japanese company, the Toyo Kisen Kaisha (Eastern Steamship Company), represented at this port by the agents for the Pacific Mail and Occidental and Oriental companies, has started running 3 new steamers of 3,000 tons each between San Francisco and Hongkong, via Japan ports and Honolulu, which are likely to have a large share of the ever-increasing trans-Pacific passenger traffic.

Of the foreign companies trading to Japan, the Canadian Pacific Steamship Company receives a subsidy from the British and Canadian Governments amounting to £80,000 ($389,320) per annum. The Peninsular and Oriental Steamship Company also receives substantial assistance from the British Government, and the Messageries Maritimes (French) and the Norddeutcher Lloyd (German) are enabled to extend their operations under subsidies. In strong contrast with these are the positions of the Pacific Mail Company, the Occidental and Oriental Company, and the Northern Pacific Company—American lines—which receive no Government encouragement whatever beyond sea postage on mail matter, which, however, is also paid to foreign vessels.

During the year 1898, there cleared from Japanese ports on foreign voyages—

Description.	Number.	Tons.
Steamers.		
Japanese	743	854,544
Foreign	1,409	2,467,890
Total	2,152	3,322,434
Japanese: *Sailing vessels.*		
New model	164	18,327
Junks	1,090	19,935
Foreign	129	172,764
Total	1,383	211,026

SHIPBUILDING.

During the last fiscal year, Japanese shipbuilding made considerable progress, the ships that were either completed or commenced in accordance with the provisions of the shipbuilding-encouragement law being 5 in number and of 15,650 tons in capacity. Besides these, there were built 177 steamers and sailing vessels with an aggregate tonnage of 16,822, showing an increase of 40 in the number of steamers and 6,003 in tonnage and a decrease of 20 in the number of sailing vessels and an increase of 704 in tonnage, as compared with the previous fiscal year. The most important of these vessels were 2 steamers of above 6,000 tons measurement each, which were built by the Mitsu Bishi Company, at Nagasaki, and, while costing much more than similar craft in Europe, have encouraged the advocates of home industries in their endeavors to train workmen and establish well-equipped yards. Aside from the construction of small cruisers, gunboats, torpedo boats, and launches, but little has been attempted in the more difficult work of building men-of-war. After the establishment of the large Government iron and steel foundry, efforts in this direction may be expected. At present, nearly all material for steamship building is imported. Steel plates are now laid down here at from £8 5s. to £9 15s. ($40.15 to $47.44) per ton.

DOCKING FACILITIES.

There are now about twenty commodious private docks in Japan, and all appear to be doing a profitable business. Yokohama now possesses two excellent dry docks of the following dimensions:

NO. 1 DOCK.

Length:	Ft.	In.
Total	503	0
On the blocks	483	5

	Ft.	in.
Width:		
Top	93	5
Bottom	75	7
Depth:		
Inside	36	3
On the sill	34	1
On the blocks—		
At spring tide	28	10
Ordinary tides	27	0

NO. 2 DOCK.

Length on the blocks	351	0
Width:		
Top	60	8
Bottom	45	11
Depth on the blocks at spring tide	27	2

A dock was also opened at Uraga, in Tokyo Bay, 12 miles south of Yokohama, on November 1, 1898. The dimensions are:

	Ft.	In.
Length:		
Top	456	10
Bottom	448	5
Width of entrance:		
Top	65	7
Bottom	53	8
Whole depth:		
Inside	34	9
On the sill	31	10
Depth of water on sill at ordinary spring tide	24	4

Another private dock at Uraga will be completed in the spring of next year. It will be 500 feet in length, 72 feet in width at top of sill, and be able to receive vessels drawing 27 feet. In connection with this dock, commodious machine and repair shops, furnished almost entirely with American machinery, will supply ample facilities for building and repairing.

The Tate no Ura graving dock was completed during the year. It was commenced in October, 1895, and its dimensions are 456 feet 10 inches in length, 65 feet 7 inches in width, and 34 feet 9 inches deep. The depth of water on sill at ordinary tides is 24 feet 4 inches.

TONNAGE DUES.

These dues, which cover port and light charges, are now collected at the rate of 5 sen (about 2½ cents) per registered ton upon entry from a foreign port. Vessels making frequent voyages are permitted to make an annual payment of 15 sen (about 7½ cents) per ton.

Vessels entering in distress, and not discharging or loading cargo, are exempt from these dues.

LIGHT-HOUSES.

The Japanese coast is well provided with these aids to the mariner. At the end of last year, there were 140 Government, 45 communal, and 21 private light-houses.

MERCANTILE-MARINE SCHOOLS.

The number of students in the mercantile-marine school at the end of the last fiscal year was 927, including those in the branches at Osaka and Hakodate, being an increase of 221 as compared with the previous year.

CERTIFICATES OF MASTERS AND MATES.

At the end of the last fiscal year, the total number of certificate holders was 7,982. During the same year, applicants for certificates totaled 3,848, of which number 1,828 were successful. These figures are more than double those of the previous year.

DISASTERS.

The shipwrecks that occurred were mostly caused, in the case of steamers, by collision, and in the case of sailing vessels, as usual, by storms. The number of ships wrecked was 545, being 49 more than in the previous year. As to shipwrecks, such preventive measures as examining vessels of Japanese style and conferring certificates on their crews were started, while steps were taken to aid popular enterprises for rescuing shipwrecked people.

WAGES.

The average daily wages paid for dockyard and machine-shop labor are as follows:

	Cents.
Machinists, turners, fitters, and boiler makers	75
Coppersmiths	62½
Pattern makers	65
Ship carpenters	60
Riggers	50
Painters	37½
Firemen and furnace men	35
Common laborers	25

These wages appear to be very low, but it should be remembered that the productive capacity of the men is low also.

The following table shows the average wages paid at this port on American, British, Japanese, and German ships:

Class.	Monthly wages.			
	American.	British.	Japanese.	German.
Mates	$50.00 to $90.00	$58.40	$25.00 to $35.00	$40.00 to $75.00
Second mates	40.00 to 60.00	48.67	15.00 to 22.50	33.75 to 40.00
Boatswains	18.00 to 20.00	26.76	9.00 to 10.00	15.50 to 18.75
Quartermasters	20.00 to 30.00		7.00 to 7.50	14.75 to 13.00
Able seamen	14.00 to 30.00	14.60	5.50	14.25 to 15.00
Ordinary seamen	12.00 to 13.00	9.73	3.50 to 4.50	4.00 to 8.75
Cooks	20.00 to 40.00	29.20		
Stewards	25.00 to 50.00	34.07		
Carpenters	40.00 to 45.00			
Chief engineers	150.00		50.00 to 60.00	62.50 to 100.00
Second engineers	70.00 to 90.00		30.00 to 40.00	53.75 to 62.50
Firemen	14.00 to 20.00	$17.00 to 20.00	5.50	15.50 to 20.00

JOHN F. GOWEY,
Consul-General.

YOKOHAMA, *October 29, 1899.*

AUSTRALASIA.

VICTORIA.

Consul-General Bray, of Melbourne, writes, under date of September 11, 1899:

I inclose herewith a memorandum from the collector of customs of Victoria on the subject of the merchant marine, to which is attached a list of the wages paid in this port.

There are no shipyards in this colony nor shipbuilding of any description.

DEPARTMENT OF TRADE AND CUSTOMS,
Melbourne, August 21, 1899.

The following particulars are furnished to the secretary to the premier in connection with the attached letter from the consul-general of the United States of America, in regard to the mercantile marine:

(1) The attached return of vessels entered and cleared, with the number of the crews thereof, will show the extent and importance of the mercantile marine of this colony.

(2) This colony has generally adopted the legislation of the Imperial Government in regard to seamen in the mercantile marine. We have also a seamen's act, relating principally to foreign seamen, providing for the arrest and punishment of deserters (copy inclosed).*

(3) Considerable attention was given a few years ago to the suppression of crimping, which was then very prevalent at the port. The licenses formerly issued

---

*Transmitted to the Commissioner of Navigation.

to shipping agents were withdrawn, and a Government official appointed as overseer of seamen, for the purpose of protecting them as far as possible from crimps and to supply men to masters. It is this officer's duty to be continually moving about among ships and boarding houses, to keep a strict lookout for any cases of crimping, and to report any illegal practice coming under his notice. Seamen are encouraged to come to his office, where they will be registered for employment without charge and assisted in obtaining ships. New arrivals are also advised as to suitable places to board, the ruling rate of wages, and prospects of obtaining employment. The results of this system have been most satisfactory, and masters have been enabled to obtain crews without unnecessary expense, inconvenience, or delay.

(4) The shipping and discharge of seamen is under the supervision of the superintendent of the mercantile marine, and his staff forms a branch of the department of trade and customs, the collector of customs holding the office first mentioned. In connection with this matter, attention might be drawn to the following practice of this department: In every instance where the superintendent reports that a seaman has suffered wrong or injustice at the hands of a master or owner, the department takes his case up, and, if necessary, by taking the case into court, sees that right is done him. The effect of this is that we hardly ever have to do so, for the knowledge that subsequent official action will be taken is generally sufficient to cause the master or owner to comply with the demands of the superintendent without further proceedings being necessary.

(5) Reports from certain foreign and colonial ports respecting desertion of seamen from British ships, which were presented to Parliament this year in Great Britain, contain a considerable amount of information in regard to the question of desertion.

(6) Beyond occasional representations from shipowners in regard to matters of detail, no interest is taken in the mercantile marine in this colony by the bodies indicated, nor is any action on their part called for.

H. N. P. WOLLASTON.

Shipping inwards, return for eleven years.

Year.	Total number of vessels entered.			From the United Kingdom.			From the Australasian colonies.			From other British possessions.			From the United States.			From other foreign states.		
	No.	Tons.	Crews.	No.	Tons.	Crews.	No.	Tons.	Crews.	No.	Tons.	Crews.	No.	Tons.	Crews.	No.	Tons.	Crews.
1888…………	2,724	2,182,071	85,879	245	452,396	15,318	2,126	1,318,449	59,177	112	121,702	3,987	92	107,107	1,654	149	182,417	5,743
1889…………	2,855	2,270,827	89,187	244	471,456	16,031	2,309	1,443,811	62,632	100	107,147	3,697	74	80,339	1,163	128	168,074	5,664
1890…………	2,474	2,178,551	85,818	210	417,543	15,448	1,976	1,372,025	59,119	189	103,580	3,765	66	73,228	1,163	133	212,175	6,323
1891…………	2,531	2,338,864	92,861	210	432,103	15,911	2,078	1,552,379	65,992	80	99,087	3,679	49	64,816	969	114	190,479	6,310
1892…………	2,255	2,224,652	91,244	181	393,846	15,344	1,875	1,526,590	65,914	75	98,567	3,939	29	37,611	556	95	168,038	5,491
1893…………	1,889	2,009,187	83,389	150	344,370	14,160	1,593	1,427,879	60,675	60	80,446	3,060	16	22,123	348	70	134,369	5,146
1894…………	2,083	2,163,716	86,468	169	388,255	14,823	1,727	1,479,070	61,960	87	113,088	3,890	21	28,066	407	79	155,237	5,388
1895…………	1,948	2,181,539	82,632	160	368,327	14,352	1,620	1,516,335	58,869	75	103,146	3,522	16	27,194	353	77	166,537	5,536
1896…………	1,882	2,276,478	83,002	160	382,452	14,685	1,547	1,582,519	58,192	71	105,846	3,883	33	48,347	671	71	157,314	5,571
1897…………	1,888	2,437,190	87,512	167	401,992	14,979	1,543	1,700,232	61,166	69	104,726	4,179	34	50,050	649	75	180,190	6,539
1898…………	2,008	2,472,745	91,208	162	403,478	15,441	1,649	1,699,194	64,138	72	108,599	3,936	45	74,339	1,023	80	187,135	6,670

Shipping outwards, return for eleven years.

Year.	Total number of vessels cleared.			For the United Kingdom.			For the Australasian colonies.			For other British possession.			For the United States.			For other foreign states.		
	No.	Tons.	Crews.	No.	Tons.	Crews.	No.	Tons.	Crews.	No.	Tons.	Crews.	No.	Tons.	Crews.	No.	Tons.	Crews.
1888…………	2,630	2,125,812	84,233	138	284,569	11,514	2,363	1,666,869	66,449	52	70,298	1,835	9	6,689	111	68	97,387	4,324
1889…………	2,886	2,328,351	89,489	135	284,392	12,440	2,584	1,820,752	70,423	58	74,128	1,602	16	18,456	293	93	130,623	4,731
1890…………	2,459	2,184,790	85,163	119	260,320	11,932	2,222	1,750,956	66,860	27	33,409	1,167	3	2,706	45	88	137,399	5,159
1891…………	2,560	2,376,245	93,179	156	320,159	13,570	2,276	1,852,193	72,668	27	39,939	1,317	8	7,184	127	93	156,770	5,497
1892…………	2,266	2,231,602	90,629	145	315,703	13,414	1,991	1,701,471	69,852	34	48,275	1,702	9	10,529	153	87	155,624	5,508
1893…………	1,887	2,020,551	83,251	148	331,519	14,132	1,617	1,486,912	62,205	36	50,634	1,788	1	967	14	85	150,519	5,112
1894…………	2,045	2,127,743	85,541	147	334,028	13,725	1,763	1,573,310	64,812	29	37,473	1,314	5	3,727	93	101	179,205	5,597
1895…………	1,889	2,167,147	81,779	154	358,586	14,128	1,619	1,586,560	59,977	40	63,964	2,449	5	4,863	79	71	153,174	5,146
1896…………	1,900	2,289,752	82,978	148	348,990	13,881	1,615	1,680,100	60,145	53	84,533	3,288	12	15,021	217	72	161,108	5,447
1897…………	1,882	2,428,182	86,869	132	333,507	14,662	1,632	1,852,093	62,820	52	83,766	3,270	7	12,043	166	59	146,773	5,951
1898…………	2,043	2,483,992	91,546	139	353,502	14,964	1,777	1,879,654	66,613	61	94,214	3,706	2	2,558	40	64	154,064	6,223

Rates of wages (coasting) in port of Melbourne.

Class.	Steam.	Sail.
First mates	$63.26 to $77.86	$38.93 to $43.79
Second mates	48.66 to 63.26	29.19 to 34.06
Boatswains	34.06	24.33
Carpenters	43.79	
Able seamen	29.19	19.46
Quartermasters	30.62	
First engineers	97.33 to 121.66	
Second engineers	77.86 to 87.59	
Third engineers	68.13 to 72.99	
Donkey men	43.79	
Firemen	38.93	
Greasers (oilers)	38.93	
Trimmers (coal passers)	29.49	

NOTE.—Vessels of other nationalities pay the current rates of wages. Deep-sea sailing vessels pay able seamen from $17.02 to $19.46, which during the wool season—about November to January—increases to $24.33 per month.

NEW ZEALAND.

In compliance with departmental instruction of June 20, 1899, to prepare, in the interests of the merchant marine of the United States, a report on the merchant marine of New Zealand, I beg to say:

(1) The Government does not pursue any policy to promote the merchant marine. There are no bonuses for shipbuilding; iron plates, screws, and castings for ships are exempt from duty.

(2) War ships are not built in New Zealand.

(3) There have been no recent changes in policies to promote the merchant marine.

(4) The marine department supervises the merchant marine and makes recommendations as to the manning of vessels, and as to the legislation for insuring their safety, and for providing proper accommodation for their crews.

(5) There are no reports published, either public or private, as to the use of mail steamships for auxiliary naval purposes.

(6) The legislation of other countries respecting the merchant marine is discussed and copied where it is considered advisable to do so.

(7) All iron and steel used for shipbuilding are imported. Timber or lumber, mainly kauri, is produced in the colony.

(8) The chambers of commerce sometimes meet to discuss the merchant marine; but this is rare, and no definite action in the matter is taken.

Registered vessels employed in home (coasting) and foreign trade, classified as to size, in 1898.

Description.	Sailing.			Steam.			Total.		
	No.	Tons.	Men and boys.	No.	Tons.	Men and boys.	No.	Tons.	Men and boys.
In the home (coasting) trade only.									
Under 50 tons	121	3,327	193	71	1,833	257	192	5,160	450
50 tons and under 100 tons	45	3,176	147	39	2,773	222	84	5,949	369
100 tons and under 200 tons	2	276	12	27	3,689	335	29	3,965	347
200 tons and under 300 tons	1	237	7	7	1,771	145	8	2,008	152
300 tons and under 400 tons	....	....	....	11	3,858	258	11	3,858	258
400 tons and under 500 tons	....	....	....	6	2,662	147	6	2,662	147
500 tons and under 600 tons	....	....	....	3	1,595	82	3	1,595	82
600 tons and under 700 tons	....	....	....	1	630	12	1	630	12
700 tons and under 800 tons	....	....	....	....	....	....	....	....	....
800 tons and under 1,000 tons	....	....	....	....	....	....	....	....	....
1,000 tons and under 1,200 tons	....	....	....	1	1,028	49	1	1,028	49
1,200 tons and under 1,500 tons	....	....	....	....	....	....	....	....	....
1,500 tons and under 2,000 tons	....	....	....	....	....	....	....	....	....
2,000 tons and under 2,500 tons	....	....	....	....	....	....	....	....	....
Total	169	7,016	359	166	19,839	1,507	335	26,855	1,866
Partly in the home and partly in the foreign trade.									
Under 50 tons	....	....	....	....	....	....	....	....	....
50 tons and under 100 tons	2	188	8	....	....	....	2	188	8
100 tons and under 200 tons	3	380	18	....	....	....	3	380	18
200 tons and under 300 tons	7	1,538	57	....	....	....	7	1,538	57
300 tons and under 400 tons	2	707	17	....	....	....	2	707	17
400 tons and under 500 tons	2	828	19	....	....	....	2	828	19
500 tons and under 600 tons	1	569	11	....	....	....	1	569	11
600 tons and under 700 tons	....	....	....	....	....	....	....	....	....
700 tons and under 800 tons	....	....	....	2	1,451	48	2	1,451	48
800 tons and under 1,000 tons	....	....	....	2	1,818	94	2	1,818	94
1,000 tons and under 1,200 tons	....	....	....	3	3,205	120	3	3,205	120
1,200 tons and under 1,500 tons	....	....	....	6	7,757	322	6	7,757	322
1,500 tons and under 2,000 tons	....	....	....	3	5,017	154	3	5,017	154
2,000 tons and under 2,500 tons	....	....	....	2	4,291	166	2	4,291	166
Total	17	4,210	130	18	23,539	904	35	27,749	1,034
In the foreign trade only.									
Under 50 tons	24	331	40	....	....	....	24	331	40
50 tons and under 100 tons	3	231	11	....	....	....	3	231	11
100 tons and under 200 tons	7	1,100	43	....	....	....	7	1,100	43
200 tons and under 300 tons	8	2,046	58	....	....	....	8	2,046	58
300 tons and under 400 tons	4	1,450	33	....	....	....	4	1,450	33
400 tons and under 500 tons	1	499	12	....	....	....	1	499	12
500 tons and under 600 tons	4	2,147	42	....	....	....	4	2,147	42
600 tons and under 700 tons	....	....	....	....	....	....	....	....	....
700 tons and under 800 tons	2	1,431	24	2	1,467	66	4	2,898	90
800 tons and under 1,000 tons	1	938	14	1	910	38	2	1,848	52
1,000 tons and under 1,200 tons	1	1,047	19	....	....	....	1	1,047	19
1,200 tons and under 1,500 tons	....	....	....	1	1,393	29	1	1,393	29
1,500 tons and under 2,000 tons	....	....	....	....	....	....	....	....	....
2,000 tons and under 2,500 tons	....	....	....	1	2,414	97	1	2,414	97
Total	55	11,220	296	5	6,184	230	60	17,404	526

Registered vessels employed in home (coasting) and foreign trade, etc.—Continued.

Description.	Sailing.			Steam.			Total.		
	No.	Tons.	Men and boys.	No.	Tons.	Men. and boys.	No.	Tons.	Men and boys.
Grand total.									
Under 50 tons	....	....	....	....	....	....	216	5,491	490
50 tons and under 100 tons	....	....	....	....	....	....	89	6,368	388
100 tons and under 200 tons	....	....	....	....	....	....	39	5,445	408
200 tons and under 300 tons	....	....	....	....	....	....	23	5,592	267
300 tons and under 400 tons	....	....	....	....	....	....	17	6,015	308
400 tons and under 500 tons	....	....	....	....	....	....	9	3,989	178
500 tons and under 600 tons	....	....	....	....	....	....	8	4,311	135
600 tons and under 700 tons	....	....	....	....	....	....	1	630	12
700 tons and under 800 tons	....	....	....	....	....	....	6	4,349	138
800 tons and under 1,000 tons	....	....	....	....	....	....	4	3,666	146
1,000 tons and under 1,200 tons	....	....	....	....	....	....	5	5,280	188
1,200 tons and under 1,500 tons	....	....	....	....	....	....	7	9,150	351
1,500 tons and under 2,000 tons	....	....	....	....	....	....	3	5,017	154
2,000 tons and under 2,500 tons	....	....	....	....	....	....	3	6,705	263
Total	....		....	....	....	....	450	72,008	3,426

Vessels registered in New Zealand

Description.	Sailing vessels.			Steam vessels.			Total.		
	Vessels.	Gross tonnage.	Net tonnage.	Vessels.	Gross tonnage.	Net tonnage.	Vessels.	Gross tonnage.	Net tonnage.
Upon register on December 31, 1897	318	40,733	39,743	188	78,980	47,806	506	119,713	87,549
Added to the register:									
Vessels registered for the first time—									
New vessels built at a port in the United Kingdom	....	....	....	3	5,864	3,502	3	5,864	3,502
New vessels built at ports in British possessions	7	399	240	7	672	473	14	1,071	813
Vessels transferred from ports in the United Kingdom	....	....	....	1	1,122	702	1	1,122	702
Vessels transferred from ports in British possessions	3	388	382	6	468	194	9	856	576
Vessels registered de novo	3	372	322	1	157	93	4	529	415
Vessels purchased from foreigners	1	316	280	....	....	....	1	316	280
Tonnage added in consequence of remeasurements or alterations (without reregistry)	....	....	....	....	118	52	....	118	52
Total added	14	1,475	1,324	18	8,401	5,016	32	9,876	6,340

Vessels registered in New Zealand—Continued.

Description.	Sailing vessels.			Steam vessels.			Total.		
	Vessels.	Gross tonnage.	Net tonnage.	Vessels.	Gross tonnage.	Net tonnage.	Vessels.	Gross tonnage.	Net tonnage.
Struck off the register:									
Vessels wrecked or otherwise lost	3	654	640	2	644	392	5	1,298	1,032
Vessels broken up or unfit for use	1	221	221	1	82	61	2	303	282
Vessels transferred to ports in British possessions	4	841	814	1	210	76	5	1,051	890
Vessels sold to foreigners	1	33	33	....	....	....	1	33	33
Vessels registered de novo	3	362	344	1	125	77	4	487	421
Other vessels	3	304	296	....	....	....	3	304	296
Total deducted	15	2,415	2,348	5	1,061	606	20	3,476	2,954
Vessels on register on December 31, 1898	317	39,793	38,719	201	86,320	52,216	518	126,113	90,935

Vessels registered belonging to each port on December 31, 1898.

Port.	Sailing vessels.			Steam vessels.		
	Vessels.	Gross tonnage.	Net tonnage.	Vessels.	Gross tonnage.	Net tonnage.
Auckland	177	13,906	13,377	75	10,181	6,253
Napier	7	778	755	16	1,023	596
Wellington	24	4,531	4,362	23	4,004	2,322
Nelson	11	281	281	10	820	516
Lyttelton	31	5,492	5,364	7	1,170	479
Dunedin	47	12,441	12,301	67	68,818	41,860
Invercargill	20	2,364	2,279	3	304	190
Total	317	39,793	38,719	201	86,320	52,216

The current price of steel plates for hulls of vessels varies considerably. It is approximately the English price plus 33⅓ per cent.

Monthly wages paid to crews of vessels in foreign trade sailing from New Zealand ports.

Class.	Sailing vessels.		Steamers.	
	£ s.		£ s. £ s.	
First mates	8 5	$40.14	14 0	$68.13
Second mates	6 0	29.19	12 0	58.40
Carpenters	5 5	25.55	10 0	48.66
Boatswains	4 10	21.90	7 10	36.50
Able-bodied seamen	4 0	19.47	6 10	31.63
First engineers	....	....	20 0 to 25 0	$97.33 to 121.66
Second engineers	....	....	16 0 to 18 0	77.86 to 87.60
Third engineers	....	....	12 0 to 14 10	58.40 to 70.56
Quartermasters	....	....	6 10	31.63
Firemen	....	....	8 10	41.37
Greasers (oilers)	....	....	8 10	41.37
Trimmers (coal passers)	....	....	6 10	31.63

Average daily wages paid in shipyards in New Zealand.

Workmen.	Wages.	
	Shillings.	
Pattern makers	10 to 14	$2.43 to $3.41
Machinists	10 to 12	2.43 to 2.92
Riveters	10	2.43
Ship carpenters	12	2.92
Joiners	10	2.43
Furnace men	8	1.95
Riggers	10	2.43
Plumbers	10	2.43
Sheet-iron workers	10	2.43
Iron and brass molders	10	2.43
Laborers	8	1.95

FRANK DILLINGHAM,
Consul.

AUCKLAND, *October 11, 1899.*

INDEX.

	Page.
Antigua	152
Australasia	172
Austria	3
Barlow, Andrew D. (consul-general, Mexico)	151
Beaupré, A. M. (consul-general, Guatemala)	152
Belgium	10
Blom, Jules (vice and deputy consul, Copenhagen)	15
Bray, John P. (consul-general, Melbourne)	172
British India	162
Byington, A. H. (consul, Naples)	75
Caldwell, John C. (consul, San José)	152
Cape Colony	162
Caples, John F. (consul, Valparaiso)	157
Carter, Martin J. (consul, St. John's)	148
Cheney, Elias H. (consul, Curaçao)	154
Chile	155
Costa Rica	151
Darte, George L. (consul, St. Pierre)	154
De Castro, Hector (consul-general, Rome)	73
De Leon, Perry M. (consul-general, Guayaquil)	158
Denmark	13
Dillingham, Frank (consul, Auckland)	179
Dominion of Canada	137
Dublin	120
Dutch India	163
Dutch West Indies	154
Ecuador	158
Everett, Sydney B. (consul, Batavia)	165
Foster, John G. (consul-general, Halifax)	150
France	16
Germany	52
Glasgow	132
Gowey, John F. (consul-general, Yokohama)	172
Guatemala	152
Guianas, the	138
Haiti	153
Hamburg	61
Supplementary report	67
Havre	16
Hall, Frank D. (consul, Amsterdam)	106
Hongkong	165
Hopley, John E. (consul, Southampton)	120
Hossfeld, Frederick W. (consul, Trieste)	9
Hunt, Henry M. (consul, Antigua)	152
Italy	68

	Page.
Japan	167
Jenkins, John (consul, San Salvador)	152
Lincoln, George F. (consul-general, Antwerp)	13
Liverpool	110
London	107
Marseilles	32
Supplementary report	49
Martinique	153
Mason, Frank H. (consul-general, Berlin)	61
Mexico	151
Moseley, R. A. (consul-general, Singapore)	167
Moulton, George H. (consul, Demerara)	158
Myers, Ira B. (consul, St. John)	148
Naples	75
Netherlands	76
New Brunswick	147
Newfoundland	148
New Zealand	175
Nova Scotia	149
Osborne, William M. (consul-general, London)	109
Paraguay	158
Patterson, R. F. (consul-general, Calcutta)	162
Pitcairn, Hugh (consul, Hamburg)	67
Ruffin, John N. (consul, Asuncion)	159
Salvador	152
Sarle, A. L. (acting consul, Zanzibar)	162
Skinner, Robert P. (consul, Marseilles)	49
Southampton	116
Stowe, J. G. (consul-general, Cape Town)	162
Straits Settlements	166
Swalm, Albert W. (consul, Montevideo)	161
Taylor, Samuel M. (consul, Glasgow)	136
Terres, John B. (consul-general, Port au Prince)	153
Thackara, A. M. (consul, Havre)	32
Toulon	50
United Kingdom	107
Uruguay	159
Victoria	172
Wilbour, Joshua (consul, Dublin)	132
Wildman, Rounsevelle (consul-general, Hongkong)	166
Zanzibar	162

LANE MEDICAL LIBRARY

To avoid fine, this book should be returned on
or before the date last stamped below.

I585 U.S.Bureau of foreign
U58 commerce. 9226
1899 Disposal of sewage and
garbage in foreign DUE
countries.